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A PRACTICAL APPROACH TO THE EVALUATION OF A FINISHING AGENT

JOHN J McDONALD and ROBERT E MORRISON

Professor, Lowell Technological Institute *Instructor, Lowell Technological Institute*

Project Participants, The Lowell Technological Institute Research Foundation

Lowell, Mass

The complexity of the field of chemical finishing and the modification of natural and synthetic fabric characteristics by chemical treatments is well known. As always, the problem of evaluating the newly developed chemicals and their effects on a textile of other allied structure is of prime importance. This paper describes an inexpensive, logical and dependable approach for the practical evaluation of one of these chemical finishing compounds. By the same or slightly modified procedure, it will be realized that other agents or combination of agents might be evaluated in like manner.

PRODUCTION

THE need for a simple and practical method to evaluate certain aesthetic effects of chemical treatments of textile materials has become extremely important during the past decade. This emphasis has been accentuated by the advent of resin-treated fabrics to achieve certain end results, such as stabilization, waterproofing, flameproofing, crease resistance, etc. The textile personnel of Lowell Technological Institute have kept pace with the advancement made in textile science and have been successful in the development and evaluation of a number of the accepted and contemplated chemicals for use in the textile industry of today and tomorrow. This review of a section of one of these investigations is intended to demonstrate a worthwhile and economical approach to the problem of product evaluation.

The Problem: To evaluate the effects on textile materials of a cationic chemical agent. It was further desired to evaluate the effects on resin-treated textile materials.

EXPERIMENTAL

The agent used in this study was applied to fabrics in the following three ways:

1) The agent was applied to the textile materials by itself.
2) The agent was applied to the textile materials as part of the resin formula.
3) The agent was applied to the textile materials after the resin had been applied and cured.

FABRICS——Three fabrics were chosen as the base textile materials:

1) A cotton 80 x 80 print cloth, which had been purified.
2) A viscose butcher fabric, which had been purified and dyed.
3) An acetate taffeta, which had been purified.

RESINS——Four different resins were used, all commercial samples:

1) urea-formaldehyde (UF)
2) cylic urea-formaldehyde (CUF)
3) melamine-formaldehyde (MF)
4) 75/25 MF/CUF (on solids basis).

APPLICATION——The various solutions were applied to the textile materials by pad application using a Butterworth 3-roll laboratory padder at 45 psi on the rolls. The agent was evaluated at a solids concentration of 2 percent on the weight of solution used. (*Note*: this one concentration was picked for competitive reasons which involve money value). The resin solutions were adjusted to give recommended solids pick-up on the fabrics and are given in Table I.

All treated fabrics were oven dried at 220°F and the resin-treated fabrics were cured at 330°F for 3 minutes. The resin-treated samples were afterwashed in a mild detergent solution at 110°F for 5 minutes.

TABLE I
Percent solids pickup of various resins on the textile materials

Resin	*Cotton*	*Viscose*	*Acetate*
UF	9	18	4
CUF	5	9	3
MF	6	9	3
MF/CUF	6	9	3

EVALUATION

All of the treated samples plus an untreated control sample were subjected to the following visual and physical tests:

1) Examination for visual yellowing after drying and after curing.
2) Visual evaluation for the effect of the agent on the various resin solutions, such as floculation, settling, foaming or precipitation.
3) Breaking strength tests according to ASTM Standard D-39, Grab Method, using a Scott J-2 machine, with three tests in the warp direction and three tests in the filling direction.
4) Wrinkle-recovery evaluation using the Monsanto Wrinkle-Recovery Tester in accordance with Monsanto Technical Bulletin No. F7, with three tests in each direction, warp and filling.
5) Abrasion Tests using the Stoll-QM Flex Abrader according to ASTM Standard D-1175-55T, with three tests in the warp direction only. The cotton and viscose fabrics were tested using a load of ½ pound on the pressure plate and a load of 4 pounds on the flex bar. The acetate fabric was tested with a load of ½ pound on the pressure plate and 3 pounds on the flex bar.
6) Tear-strength tests using the Elmendorf Tear Test machine in accordance with Specification CCC-T-191b, Method 5132, with NBS augmenting weight, and with three tests in each direction, warp and filling.

All of the physical tests were made on fabrics which had been conditioned

TABLE II

Breaking strength as percent of untreated fabric breaking strength

	Cotton	Viscose	Acetate
Untreated fabric	100	100	100
Agent alone	83.9	101.7	100.4
Resins alone			
UF	78.1	111.5	107.0
CUF	58.6	106.0	102.0
MF	89.5	111.0	99.6
MF/CUF	50.9	110.8	94.3
Agent applied after resin treat			
UF	74.9	115.3	91.0
CUF	56.0	117.2	98.8
MF	77.2	119.5	100.0
MF/CUF	52.9	123.0	94.0
Agent/resin applied from same solution			
UF	62.6	126.0	104.5
CUF	46.3	116.0	95.2
MF	55.2	128.0	91.6
MF/CUF	53.2	110.0	99.8

TABLE III

Wrinkle recovery as percent of untreated fabric wrinkle recovery

	Cotton	Viscose	Acetate
Untreated fabric	100	100	100
Agent alone	100.8	137.2	121.0
Resins alone			
UF	163	145	115
CUF	236	137	117
MF	130	139	60
MF/CUF	219	109	62
Product applied after resin treat			
UF	138	181	110
CUF	214	184	111
MF	151	167	72
MF/CUF	234	143	63
Product/resin applied from same solution			
UF	195	160	112
CUF	264	165	131
MF	214	166	87
MF/CUF	237	169	98

TABLE IV

Tear strength as percent of untreated fabric tear strength

	Cotton	Viscose	Acetate
Untreated fabric	100	100	100
Agent alone	101	no values beyond capacity of machine	98
Resins alone			
UF	106	107	84
CUF	80	94	54
MF	80	91	52
MF/CUF	42	82	50
Product applied after resin treat			
UF	84	no values beyond capacity of machine	84
CUF	65		65
MF	85		52
MF/CUF	38		56
Product/resin applied from same solution			
UF	72	no values beyond capacity of machine	86
CUF	50		73
MF	56		51
MF/CUF	39		63

TABLE V

Abrasion resistance as percent of untreated fabric abrasion resistance

	Cotton	Viscose	Acetate
Untreated fabric	100	100	100
Agent alone	730	930	135
Resins alone			
UF	78	120	66
CUF	51	140	45
MF	63	120	52
MF/CUF	26	78	30
Product applied after resin treat			
UF	570	1010	75
CUF	290	980	48
MF	460	1280	70
MF/CUF	25	680	98
Product/resin applied from same solution			
UF	176	330	104
CUF	27	170	40
MF	32	660	40
MF/CUF	42	280	60

for a minimum of 12 hours at 70°F and 65% RH.

Tables II, III, IV and V list the results of the physical tests. The results were calculated as a percent change from the original untreated fabric. If tests were made in both warp and filling directions, the results of each were added together and the percent change calculated.

DISCUSSION

VISUAL EXAMINATION

Discoloration. The agent did not appear to have any adverse effect on the yellowing of the fabric after drying and curing.

Solubility. Because the agent was semisolid at room temperature, heat was necessary to effect good solubility. At 70 to 80°C (158°F-176°F), the product mixed into solution quite readily.

Shelf Life. The shelf life (emulsion stability) of a 5% water emulsion was quite good. There was no obvious separation or creaming for at least 10 hours.

Agent/Resin Solution. The agent added to the resin bath at 2% solids on the weight of the solution did not have any adverse effect on viscosity or apparent pick-up and was stable at least for the duration of the application.

PHYSICAL TESTS

Breaking Strength (*Table II*). When the agent was used in conjunction with resin treatment on cotton, either applied with the resin or after the resin cure, there was a tendency to reduce the strength. The agent alone reduces the strength of the cotton fabric more than it does when used in conjunction with the resins in relation to the resins alone.

Viscose fabric, when treated with the agent as part of the resin formula or aftertreated with the agent, has slightly better strength except when the agent is applied following MF/-CUF resin test.

In the case of the treatment of acetate fabric, the agent does not exhibit any definite trend except, of course, to change the hand somewhat.

The statements made above are only intended as a general summary of the breaking-strength results. As can be seen, individual resins and the choice of agent application results, in some cases, in variations from these general statements.

Wrinkle Recovery (*Table III*). The wrinkle-recovery results on cotton indicate that the agent when applied with the resin has the most desirable effects on all resins as compared to resins alone.

Viscose-rayon fabrics, resin-treated with the agent as part of the resin formula and also with the agent applied after resin cure, exhibited definite improvement in wrinkle recovery as compared with resin treatment alone.

The application of the agent on acetate fabric does not appear to have any advantageous effect on wrinkle-recovery characteristics except when applied after curing of the CUF, MF and MF/CUF resins.

Here again the above statements are only meant to be general deductions, more as a means of establishing a trend than to specifically determine optimum conditions.

Tear Strength (*Table IV*). Except for the viscose fabric, there does not appear to be advantage in tear strength derived from the use of the product in question.

Abrasion Resistance (*Table V*). The results of the abrasion resistance tests show a marked improvement when the fabrics are treated with the combined resin/agent mix.

SUMMARY

The work reported here represents only a part of a project carried out at Lowell Technological Institute for the LTI Research Foundation, and points out the necessity for careful and detailed evaluation of a product to be used in the textile field. It becomes obvious, when analyzing the data given by the various test methods, that no one characteristic can adequately be utilized as a genuinely representative evaluation.

Many conclusions, both practical and theoretical, may be derived from the data presented; however, it is not within the scope of this paper to do so. The purpose of this publication is to point out the type of laboratory and pilot plant study which is so necessary and vital prior to the successful adoption of a textile-finishing agent.

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TEST FOR DIMENSIONAL CHANGES IN WOVEN FABRICS IN HIGH-TEMPERATURE LAUNDERING

WM D APPEL

Chairman, ASA Committee L23 American Committee on ISO/TC 38—Textiles; Chief, Textiles Section, National Bureau of Standards

This paper summarizes the results of a study of a test for dimensional changes in woven fabrics in laundering carried out in the International Organization for Standardization. Twenty laboratories in fifteen countries participated. The purpose was to provide a basis for agreement on the test to be issued as an ISO Recommendation for international use. An increase in the duration of the test from 60 to 100 minutes led to very little increase in shrinkage. An increase in the load of fabric tested at one time from 0.5 pound to 3 pounds per cubic foot had very little consistent effect upon the shrinkage. The dimensional changes in the test applied one or more times and in the same number of commercial launderings were in close agreement. The standard deviation expressing variability between replicate specimens of the fabrics tested at different times under the same conditions in the same laboratory was 0.56 in percent shrinkage; 0.85 between replicate specimens tested in different laboratories.

INTRODUCTION

DURING the past three years interlaboratory studies of a test for the dimensional changes in woven fabrics in high-temperature laundering have been in progress under the auspices of Subcommittee 2 on Shrinkage in Washing of Technical Committee 38—Textiles, International Organization for Standardization. Twenty laboratories in fifteen countries have participated. The work has now been completed and a report on it has just been issued by the American Standards Association, the Secretariat of the Subcommittee. The results obtained are summarized in this paper.

American participation in the work was carried on by the ASA with the help of a committee composed of Harry C Donaldson Jr, *Chairman;* Wm D Appel, Charles E Hilton, Leonard S Little, Ralph B Smith, John F Warner, and Jackson W Woodruff. John Mandel and Mary N Steel, statisticians at the National Bureau of Standards in Washington, selected the design for the study and made statistical analyses of the data obtained. The special statistical treatment required for the analysis given in Table IV was provided by W S Connor of the NBS staff. Ten of the fabrics used in the studies were supplied by mills in the United States and six by organizations in England. They were cut into specimens labeled and shipped by the American Association of Textile Chemists and Colorists' Laboratories, Lowell, Mass, and the British Launderer's Research Association Laboratories in London.

The primary purpose of the work was to find out how the results of the shrinkage test under consideration by Subcommittee 2 are affected by changes in the duration of the treatment with soap solution. All other features of the test had been agreed upon by the Subcommittee. Other purposes were to find out whether the results are affected by changes in the load of cloth tested at one time within the range permitted by the method, how the dimensions of specimens changed in repeated tests, and the reproducibility of the test. In addition, dimensional changes in the test were compared with those in commercial laundering in several countries.

DISCUSSION

TEST METHOD ——— The test method on which the studies were based is given in Appendix A. It is similar to, though not identical with, the method which has been used for many years in the United States for testing the shrinkage in laundering of cotton fabrics(*1*).

FABRICS TESTED———The fabrics used in the tests are described in Table I. They were selected to give different types of behavior in laundering. One of them undergoes very little change in dimensions in one test or in one commercial laundering or even in 20 tests or launderings. Others shrink or stretch in varying amounts. Some undergo relatively little change in repeated tests or launderings after the first; others undergo progressive changes in dimensions.

PREPARATION OF SPECIMENS ———Each fabric was in one continuous piece. It was cut into specimens 24 inches long and the full width of the piece, except for the two gabardines which were wide fabrics and were cut to give specimens half the width. Each specimen was identified by a letter designating the fabric and a number designating the position of the specimen along the length of the piece. Specimens were taken at intervals along the length of each fabric for use in each of the studies and in

TABLE I
Fabrics Tested

Fabric	Finish	Designation	Approximate Weight (oz/yd²)	Approximate No. yarns per inch warp	Approximate No. yarns per inch filling
Broadcloth shirting, cotton	unshrunk	M	3.4	144	60
	shrunk	N	3.5	141	62
Chambray, cotton	unshrunk	P	3.0	86	76
	shrunk	O	3.2	94	74
Denim	unshrunk	L	9.1	66	45
	shrunk	K	11.0	69	52
Drill, cotton, mineral khaki	unshrunk	E	8.6	83	44
	shrunk	F	9.0	82	49
Drill, cotton, sulfur blue	unshrunk	G	9.4	84	47
	shrunk	H	9.8	83	49
Drill, cotton, white	unshrunk	C	7.4	100	58
	shrunk	D	8.0	100	62
Gabardine, rayon	regular	J	4.9	89	62
	stabilized	I	5.0	90	61
Printcloth, cotton	unshrunk	B	3.8	79	89
	stabilized	A	3.6	85	84

each participating laboratory in such a manner as to minimize effects of variations in the fabrics. Laboratories were identified by code numbers.

DISTRIBUTION OF SPECIMENS ———The specimens were cut, labeled, assembled, and shipped to each participating laboratory. The laboratory then conditioned the specimens, marked and measured them in accordance with the instructions in the test method, carried out the prescribed shrinkage tests, and reported the results on forms provided for the purpose.

The following countries participated in one or more of the tests: Belgium, Canada, Czechoslovakia (2 laboratories), Denmark, France (2 laboratories), Germany (2 laboratories), Japan, Netherlands, Norway, Poland, South Africa, Sweden, Switzerland, United Kingdom (2 laboratories), United States (2 laboratories and one laundry).

STUDY OF EFFECT OF DURATION OF TEST———Twelve countries volunteered for this study. An experimental design (2) was chosen in which each country would test 8 of the 16 fabrics and each fabric would be tested by 6 countries. This design was expected to give reliable information, with a reasonable quantity of fabric. It was set up with code designations both for the countries and the fabrics. The designations were allocated using a table of random numbers. Unfortunately, one of the laboratories failed to report any results. This upset the statistical plan and complicated the analysis.

After the study was started, other countries found it possible to participate. They were supplied with fabrics for test to the extent they were available. Their results are included in the report and in the discussion of results, where possible, although not in the statistical analyses.

Three different durations of test (total running times) were used, namely 60, 80, and 100 minutes, corresponding respectively to 40, 60, and 80 minutes treatment with soap solution. The remaining 20 minutes in each test was taken up with draining and rinsing operations. One specimen of each assigned fabric was used in each test. The three tests were repeated with new specimens to provide data on the duplicability of results. These six tests were repeated, usually four or more times, using the same specimens to provide data on progressive changes in the dimensions of the specimens.

The load, that is, the total weight of air-dry fabric placed in the machine for each test, was 1.75 pounds per cubic foot of cage space. The load was made up of test specimens and enough additional fabric to give the required weight.

Figures 1 through 8 give the average results for the 60-minute and 100-minute tests. The average dimensional changes in percent, warp and filling directions separately, based upon the results from all of the laboratories, are plotted against the number of times the test was applied. The 60-minute test results are represented by dots, the 100-minute by open circles. It is apparent that an increase in the duration of the test from 60 to 100 minutes had no effect or only a small effect upon the changes in dimensions. Table II gives the numerical differences for increases in duration from 60 to 80 minutes as well as 60 to 100 minutes.

It will be noted that the number of times the test was applied is plotted in the figures on a logarithmic scale. On this basis the data fall approximately along straight lines and the slopes of the lines are an indication of the progressive changes in dimensions in repeated tests. The figures show that some of the fabrics continued to shrink consistently through 20 tests. Others reached or are approaching dimensional stability in less than 20 tests. The shrinkage of still others, notably the shrunk mineral khaki and both regular finish and stabilized finish gabardines, appears to accelerate after a number of tests. For these fabrics it appears that the characteristics of the finish and structure that tend to oppose shrinkage change and shrinkage then proceeds faster.

The results of a statistical analysis based upon the data from the eleven laboratories participating in the test as originally designed show that the effect of duration within the range studied is too small to be statistically significant for an individual material in a given direction. However, simultaneous consideration of all measurements included in the analysis shows an increase in shrinkage in all but one of the twenty-five results in which shrinkage occurred. On this basis the results are statistically significant and show that the effect of increasing the duration from 60 to 100 minutes, although small, can be detected.

DUPLICABILITY OF RESULTS ———As the duplicability of the test method might be expected to vary

TABLE II

Comparison of results of the 60-, 80-, and 100-minute tests, applied once; Averages for all laboratories†

Fabric	Direction	Average shrinkage or stretch (+) in percent: 60-min test	80-min test	100-min test	Difference in results between: 60 and 80 minutes	60 and 100 minutes
Broadcloth shirting	U — W	2.9	3.0	2.9	0.1	0.0
" "	" — F	+0.7	+0.6	+0.6	0.1*	0.1*
" "	S — W	+0.6	+0.6	+0.6	0.0	0.0
" "	" — F	0.4	0.3	0.4	0.1	0.1
Chambray	U — W	7.6	7.2	7.7	0.4	0.1
"	" — F	6.7	6.8	7.0	0.1	0.3
"	S — W	0.5	0.5	0.6	0.0	0.1
"	" — F	1.2	1.3	1.5	0.1	0.3
Denim	U — W	11.4	11.5	11.7	0.1	0.3
"	" — F	5.0	5.1	5.4	0.1	0.4
"	S — W	0.0	0.3	0.0	0.3	0.0
"	" — F	0.7	0.7	1.0	0.0	0.3
Drill, mineral khaki	U — W	8.1	8.6	8.1	0.5	0.0
" " "	" — F	0.0	+0.2	+0.1	0.2	0.1
" " "	S — W	+0.6	+0.4	0.2	0.2*	0.4*
" " "	" — F	+0.4	+0.3	+0.3	0.1*	0.1*
Drill, sulfur blue	U — W	10.2	10.6	10.9	0.4*	0.7
" " "	" — F	+1.8	+1.5	+1.3	0.3*	0.5*
" " "	S — W	1.6	1.8	2.0	0.2	0.4
" " "	" — F	2.4	2.4	2.5	0.0	0.1
Drill, white	U — W	6.8	7.0	7.2	0.2	0.4
" "	" — F	+0.4	+0.3	+0.4	0.1*	0.0
" "	S — W	0.7	1.0	1.0	0.3	0.3
" "	" — F	0.6	0.5	0.6	0.1*	0.0
Gabardine, rayon	Reg W	14.4	14.8	15.7	0.4	1.3
" "	" — F	1.7	1.6	1.8	0.1*	0.1
" "	Stab W	2.5	2.8	3.2	0.3	0.7
" "	" — F	0.5	0.5	0.5	0.0	0.0
Printcloth	U — W	5.6	5.7	6.0	0.1	0.4
"	" — F	7.7	8.0	8.0	0.3	0.3
"	Stab W	0.5	0.6	0.6	0.1	0.1
"	" — F	0.8	0.8	1.0	0.0	0.2

U—unshrunk
S—shrunk
Reg—regular finish
Stab—stabilized finish

W—warp direction
F—filling direction
* —less change in dimension in 80-minute or 100-minute test than in 60-minute test.
+—increase in dimension

†The number of laboratories whose results are included in each average varied from 9 to 12.

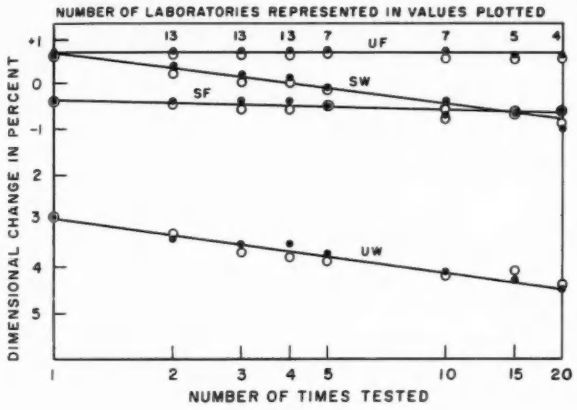


Figure 1
Broadcloth shirting, average dimensional changes based upon the results from all laboratories

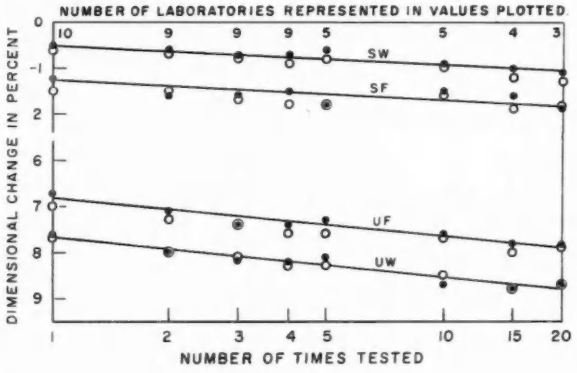


Figure 2
Chambray, average dimensional changes based upon the results from all laboratories

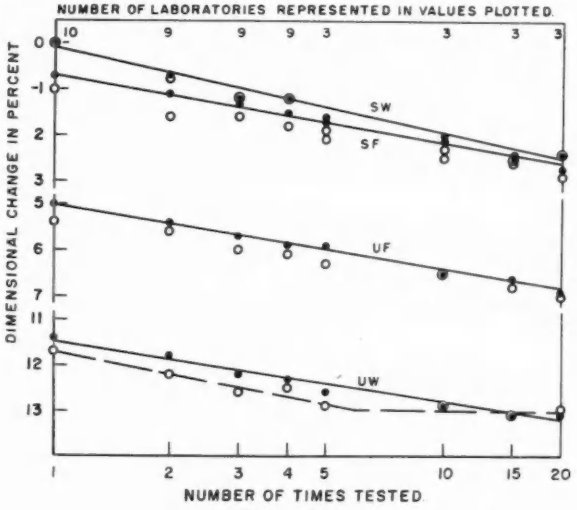


Figure 3
Denim, average dimensional changes based upon the results from all laboratories

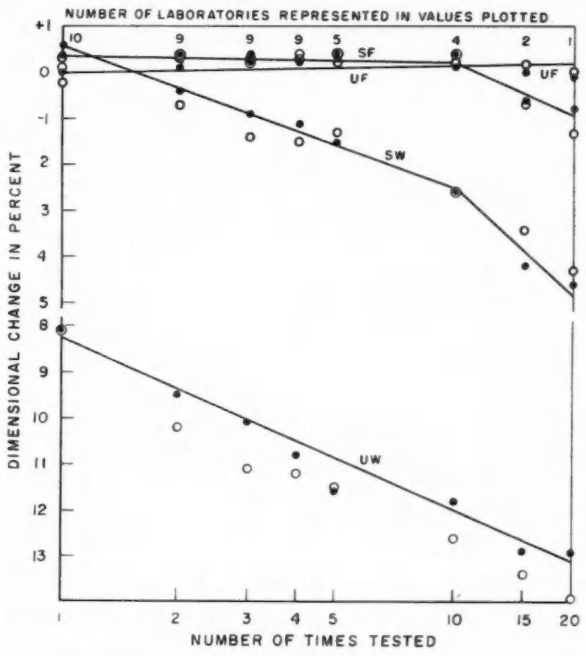


Figure 4
Drill, mineral khaki, average dimensional changes based upon the results from all laboratories

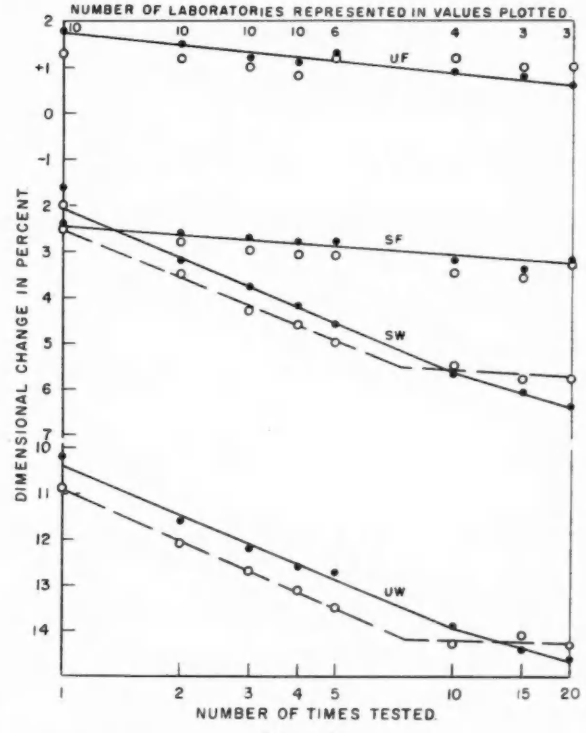


Figure 5
Drill, sulfur blue, average dimensional changes based upon the results from all laboratories

●—60-minute test
○—100-minute test
UF—Unshrunk fabric, filling direction
SF—Shrunk fabric, filling direction
SW—Shrunk fabric, warp direction
UW—Unshrunk fabric, warp direction

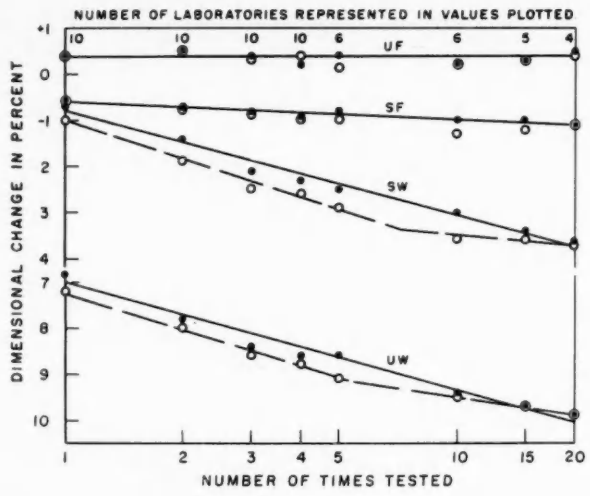


Figure 6
Drill, white, average dimensional changes based upon the results from all laboratories

(See legend under Figure 7)

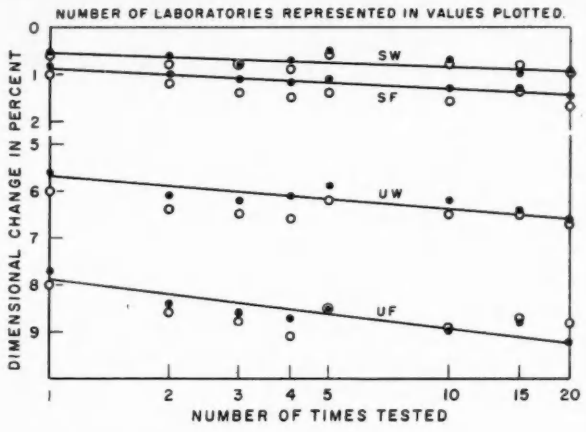


Figure 8
Printcloth, average dimensional changes based upon the results from all laboratories

●—60-minute test
○—100-minute test
SW—Shrunk fabric, warp direction
SF—Shrunk fabric, filling direction
UW—Unshrunk fabric, warp direction
UF—Unshrunk fabric, filling direction

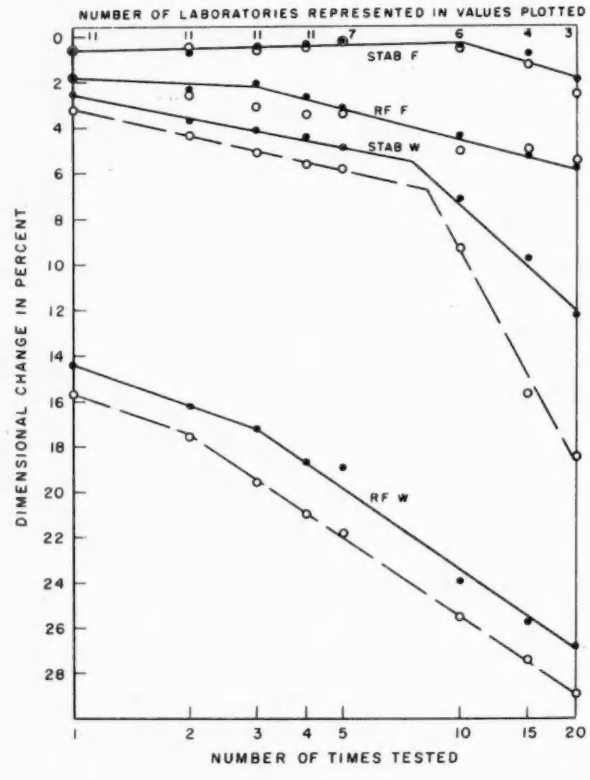


Figure 7
Gabardine, rayon, average dimensional changes based upon the results from all laboratories

●—60-minute test
○—100-minute test
Stab F—Stabilized finish, filling direction
RF F—Regular finish, filling direction
Stab W—Stabilized finish, warp direction
RF W—Regular finish, warp direction

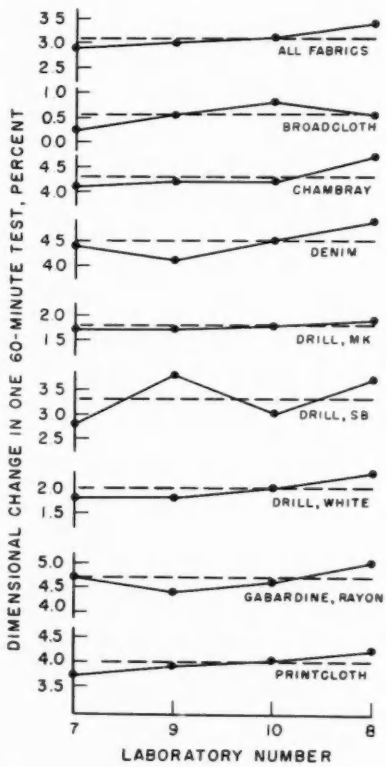


Figure 9
Comparison of the results from four laboratories
Plotted values are averages for shrunk and unshrunk fabrics, warp and filling directions, and loads of 0.5 lb and 3.0 lb per cubic foot of cage space in the testing machine.
— — — Average value for the four laboratories.

TABLE III

Data arranged by laboratories

Laboratory	Corrected average percents[1] unshrunk warp	unshrunk filling	shrunk warp	shrunk filling	Rank of average unshrunk warp	unshrunk filling	shrunk warp	shrunk filling
1	13.20	4.06	0.67	1.26	9	10	6	8
2	14.40	6.06	4.07	2.53	10	11	11	10
3	7.18	2.65	1.73	5.40	1	6	9	11
4	10.24	3.27	0.23*	0.90	3	7	3	7
5	9.78	0.22*	0.32	0.89*	2	1	4	1
6	11.43	1.62	0.82	0.52*	6	2	7	2
7	11.08	2.30	0.44*	0.15*	4	3	2	3
8	15.05	3.59	0.34	0.60	11	9	5	6
9	12.48	2.64	0.95	0.16	7	5	8	4
10	12.65	2.38	2.63	0.41	8	4	10	5
12	11.21	3.37	1.54*	2.10	5	8	1	9

[1]Calculated according to theory of incomplete block designs.
*Material stretched instead of shrinking.

TABLE IV

Analysis of variance

Condition	Source of Variation	Degrees of freedom	Mean squares	Standard deviation in percent*
Unshrunk-warp	materials	7	116.86	
	laboratories	10	2.26	
	interaction	26	.62	0.79
Unshrunk-filling	materials	7	128.67	
	laboratories	10	1.08	
	interaction	26	.44	0.66
Shrunk-warp	materials	7	10.90	
	laboratories	10	1.02	
	interaction	26	.54	0.73
Shrunk-filling	materials	7	3.96	
	laboratories	10	1.46	
	interaction	26	.21	0.46

*For purposes of comparison the standard deviation of replicate specimens is 0.56.

from one laboratory to another and with different test conditions, analyses of variance were made to show such effects on the data from the eleven laboratories referred to above. No consistent effects were found; therefore, it seemed advisable to consider these variations as chance effects rather than systematic phenomena. Under this assumption, an over-all measure of variability was calculated. The standard deviation of measurements of shrinkage made on duplicate specimens tested at different times under the same conditions in the same laboratory was 0.56 in percent shrinkage. If the variability in shrinkage values between laboratories was also taken into account, the standard deviation was 0.85 in percent shrinkage.

AGREEMENT BETWEEN LABORATORIES——The majority of the laboratories participating in the tests did not fully meet the conditions specified in the test method. Divergencies were reported in diameter of the cage of the wash wheel, number of lifters in it, peripheral speed, number of revolutions before reversal, starting temperature, time to reach the 95° C minimum called for, and temperature and other conditions of pressing. The agreement between laboratories was better than might have been expected in view of these differences in testing conditions.

Table III gives the averages yielded by the statistical analysis for laboratories and the ranking of laboratories in order of increasing shrinkage. The question arises as to whether the various laboratories rank the material in the same relative order. Information on this point can be obtained from the four analyses of variance given in Table IV, referring to the shrunk and unshrunk materials both in warp and filling direction. If the term denoted "interaction" is large with respect to the error of measurement, lack of agreement among the laboratories in the ranking of materials is indicated. As the interaction term is actually of the order of magnitude of the error of measurement, 0.56 standard deviation of replicate specimens, there appears to be good agreement in the ranking of the materials by participating laboratories for each condition.

The rankings of the laboratories in Table III agree very well for shrunk and unshrunk fabrics in the filling direction with the exception of one laboratory. The rankings in the warp direction show somewhat poorer correlation between shrunk and unshrunk fabrics. If the one laboratory is omitted, the correlation is improved but remains, nevertheless, far smaller than that observed in the filling direction.

Comparing the rankings of the fabrics by the laboratories in the two directions of test, very little correlation is found.

A comparison of the results from four laboratories in regard to the effect of the load in the washing machine is easy because all four of

TABLE V

Comparison of results using 0.5-pound and 3.0-pound loads in one 60-minute test, and in one 100-minute test; Averages for the four participating laboratories

Fabric	Direction		60-minute test: Shrinkage or stretch (+) in percent, 0.5-lb load	60-minute test: Shrinkage or stretch (+) in percent, 3.0-lb load	60-minute test: Difference in results, 0.5- and 3.0-lb loads	100-minute test: Shrinkage or stretch (+) in percent, 0.5-lb load	100-minute test: Shrinkage or stretch (+) in percent, 3.0-lb load	100-minute test: Difference in results, 0.5- and 3.0-lb loads
Broadcloth shirting	U	W	2.9	3.0	0.1	3.2	3.1	0.1
" "	"	F	+0.5	+0.5	0.0	+0.7	+0.8	0.1
" "	S	W	+0.7	+0.7	0.0	+0.9	+0.2	0.7*
" "	"	F	+0.3	+0.5	0.2	+0.5	+0.6	0.1
Chambray	U	W	7.7	8.1	0.4	7.5	8.3	0.8
"	"	F	6.7	7.0	0.3	7.3	6.9	0.4*
"	S	W	0.6	0.3	0.3*	0.5	0.7	0.2
"	"	F	1.1	2.8	1.7	0.7	0.8	0.1
Denim	U	W	11.2	11.1	0.1*	11.4	11.5	0.1
"	"	F	5.5	5.0	0.5*	5.6	5.1	0.5*
"	S	W	1.1	0.5	0.6*	1.0	0.7	0.3*
"	"	F	0.9	0.6	0.3*	0.9	0.7	0.2*
Drill, mineral khaki	U	W	8.3	8.0	0.3*	8.7	8.6	0.1*
" " "	"	F	0.1	0.1	0.0	+0.3	+0.2	0.1*
" " "	S	W	+1.1	+1.2	0.1	+0.9	0.4	1.3*
" " "	"	F	0.1	+0.2	0.3	+0.7	+0.9	0.2
Drill, sulfur blue	U	W	10.5	9.8	0.7*	10.5	10.7	0.2
" " "	"	F	+0.7	+0.3	0.4*	+1.7	+1.7	0.0
" " "	S	W	1.5	1.4	0.1*	1.8	1.8	0.0
" " "	"	F	2.4	2.2	0.2*	2.2	2.4	0.2
Drill, white	U	W	7.0	6.8	0.2*	7.1	7.3	0.2
" "	"	F	+0.5	+0.4	0.1*	+0.8	+0.3	0.5*
" "	S	W	0.8	1.0	0.2	0.9	1.2	0.3
" "	"	F	0.4	0.7	0.3	0.7	0.8	0.1
Garbardine, rayon	Reg	W	15.0	13.9	1.1*	14.9	14.5	0.4*
" "	"	F	1.9	1.2	0.7*	1.7	1.1	0.6*
" "	Stab	W	2.8	2.5	0.3*	2.7	3.2	0.5
" "	"	F	0.5	+0.2	0.7*	0.1	0.9	0.8
Printcloth	U	W	5.4	6.4	1.0	5.9	6.2	0.3
"	"	F	8.6	8.2	0.4*	8.1	8.7	0.6
"	Stab	W	0.6	0.7	0.1	0.6	0.8	0.2
"	"	F	0.8	1.1	0.3	1.0	1.1	0.1

U—unshrunk
S—shrunk
Reg—regular finish
Stab—stabilized finish
W—warp direction
F—filling direction
*—less change in test with 3.0-lb load than in that with 0.5-lb load.
+—increase in dimension

the participating laboratories tested all of the fabrics. The average results for all fabrics including unshrunk and shrunk, warp and filling directions, and results with two different loads of cloth in the machine are plotted in Figure 9. They show that results from Laboratory No. 7 were slightly lower than the average for all 4 laboratories and those for Laboratory No. 8 slightly higher. The over-all range was, however, only 0.5% shrinkage. Taking the results for the 8 kinds of fabrics individually, the range from Laboratory 7 to Laboratory 8 exceeded 0.5% for only one fabric, the drill, sulfur blue.

STUDY OF THE EFFECT OF LOAD———All of the fabrics were tested by one laboratory in each of four countries to show the differences in shrinkage or stretch resulting from changes in the load of cloth in the washing machine as a basis for judging the acceptability of the present limits on the load called for in the test method. Tests were carried out with loads of 0.5 pound and 3.0 pounds per cubic foot of cage space. These are the lower and upper limiting loads in the test method. Each load was run with durations of 60 and 100 minutes, the shortest and longest used in the study of the effect of duration. One specimen of each of the 16 fabrics was used in each test. The four tests were then repeated a total of four times with the same specimens.

The average values for loads of 0.5 pound and 3.0 pounds per cubic foot of cage space in the machine in one 60-minute test and in one 100-minute test are given in Table V. With few exceptions the differences are small. The number of comparisons in which the changes in dimensions were greater in the tests with the 3-pound load than with the 0.5-pound load were 17 out of 32 in the 60-minute test and 11 out of 32 in the 100-minute test. Thus, it may be concluded from casual inspection that the load is not an important factor within the range studied.

The average increases in shrinkage for an increase in load from 0.5 pound to 3 pounds per cubic foot are summarized in Table VI. Analyses of variances were made of the manner in which the load effect might vary with direction, warp or filling, of the measurement, with duration of washings, and from laboratory to laboratory. The analyses showed that the load effect was unchanged by these factors.

It is seen from Table VI that an increase in load produced in some fabrics more, and in others less shrinkage. Only in 4 out of 16 was the effect statistically significant, three of which occurred for the shrunk fabrics. Of these three, the effect was positive (increased shrinkage with increase in load) for two fabrics and negative (decreased shrinkage with increase in load) for one fabric. Thus, an increase in load of the magnitude studied appears to have had very little, if any, real effect on the changes in dimensions of the materials tested.

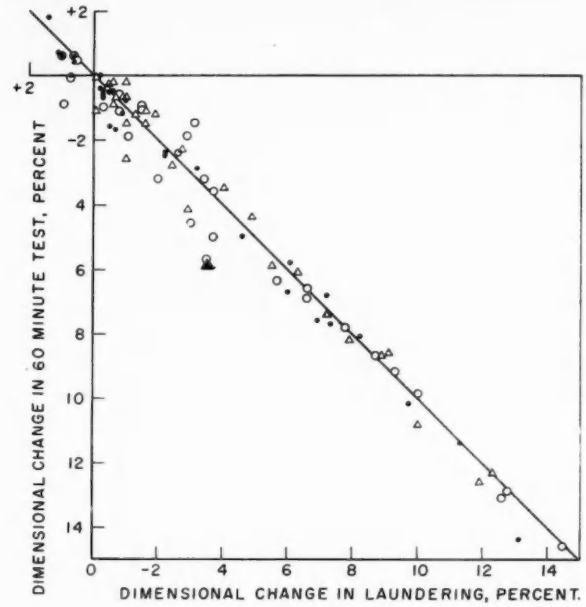


Figure 10
Comparison of dimensional changes of 16 fabrics in warp and filling directions in repeated 60-minute tests with those in repeated commercial laundering

●—One test (average for 10 to 13 laboratories) and one laundering (averages for 5 laundries).
△—Four tests (averages for 8 to 12 laboratories) and four launderings (averages for 4 laundries).
○—Twenty tests (averages for 1 to 4 laboratories) and twenty launderings (averages for 2 laundries).

SHRINKAGE IN COMMERCIAL LAUNDERING———The plan called for laundering one specimen of each of the 16 fabrics in a commercial laundering as carried out in the member country and repeating the laundering with the same specimens a number of times to reveal progressive changes in dimensions. The launderings were then to be repeated with a new set of specimens to provide data on duplicability. Five countries participated in this study. Two of them classified the fabrics into "white work," "light colors," and "dark colors" and used laundering procedures appropriate to these classes in accordance with commercial practice in the country. One of these countries used a 42 x 84-inch wash wheel with a load of 300 pounds for all three classes of work. The other used a 36 x 64-inch wash wheel and load of 150 pounds for the white work, 36 x 54-inch wash wheel and load of 150 pounds for the light colors, and 24 x 36-inch wash wheel and load of 50-60 pounds for the dark colors. The machines and loads used by the other three countries ranged down to those used for the test.

The average results for 1, 4, and 20 launderings are plotted in Figure 10 against the average results for 1, 4, and 20 tests. The values fall along

TABLE VI
Effect of load

Increase or decrease (-) in percent shrinkage with increase in load from 0.5 to 3.0 pounds per cubic foot.

Material	*Unshrunk*	*Shrunk*
Broadcloth	−0.01	0.25
Chambray	0.28	0.34
Denim	−0.25	−0.33[a]
Drill-mineral	−0.07	0.17
Drill-blue	−0.04	−0.06
Drill-white	0.16	0.19[b]
Gabardine	−0.69[b]	0.04
Printcloth	0.29	0.17[a]

[a] Significant at 1% level.
[b] Significant at 5% level.

a 45-degree line passing through the origin. Thus it appears that the average results in 1, 4, and 20 sixty-minute tests are in good agreement with the average results in the same number of commercial launderings.

CONCLUSIONS

The principal conclusions to be drawn from the data obtained may be summarized as follows.

1) *Effect of duration.* The effect on the results of an increase in duration of the test from 60 minutes to 100 minutes was negligible or nearly so, though an increase in shrinkage was statistically detectable when the combined data for all fabrics were analyzed.

2) *Duplicability of the test.* The standard deviation expressing variability between replicate specimens of the fabrics tested at different times under the same conditions in the same laboratory was of the order of 0.56 in percent shrinkage. The standard deviation expressing variability between replicate specimens tested in different laboratories was of the order of 0.85 in percent shrinkage.

3) *Effect of load.* An increase in the load of fabric in the testing machine from 0.5 pound to 3 pounds per cubic foot of cage space had very little if any consistent effect upon the average changes in dimensions of the fabrics tested.

4) *Comparison of dimensional changes in the test with those in commercial laundering.* The average dimensional changes of the fabrics in 1, 4, and 20 60-minute tests and in the same number of commercial launderings were in close agreement. Thus the test did not accelerate the shrinkage beyond that in the commercial laundering and repeated tests of the same specimens are required to show the extent of shrinkage to be expected in a given number of launderings.

REFERENCES

(1) AATCC Method 14-53; ASTM Method D 437-36; Federal Test Method CCC-T191b, Method 5550.1.

(2) Design SR 9, page 142, "Tables of Partially Balanced Designs with Two Associate Classes" by Bose, Clatworthy, and Shrikande, North Carolina Exp Sta Tech Bull #107.

APPENDIX A

METHOD OF TEST FOR DIMENSIONA L CHANGE OF WOVEN FABRICS TO BE SUBJECTED TO HIGH-TEMPERATURE LAUNDERING

This method is part of the Proposed Fourth Draft of the method as given in ISO Document ISO/TC 38/SC 2 (USA Secretariat 25)44 February 11, 1957. It differs from the Proposed Third Draft which was distributed in connection with the shrinkage studies only in editorial matters.

1) Purpose and Scope

1.1 The method is intended for determining the dimensional change, shrinking, or stretching, to be expected of woven fabrics when the cloth is subjected to commercial or home laundering as usually applied to cotton and linen fabrics.

NOTE: The test has been devised principally for cotton and linen fabrics. If it is applied to fabrics containing other fibers or having special finishes, the possibility of progressive shrinkage should be considered.

2) Principle

2.1 A specimen is washed in a cylindrical reversing laundry machine under specified conditions. It is extracted and pressed without preliminary drying. Distances marked on the specimen in warp and filling directions are measured before and after it is laundered.

3) Materials and Apparatus

3.1 DETERGENT, SOAP———A stock solution may be prepared by dissolving one pound of soap in one gallon of hot water. When cooled, this forms a thick homogeneous jelly which may be used as required.

Soap meeting the following specification[1] is satisfactory:

Moisture and matter volatile at 105°C (221°F)	maximum percent, 10.0
Sum of free alkali, total matter insoluble in alcohol, and sodium chloride	maximum percent, 4.0
Free alkali, calculated as NaOH	maximum percent, 0.2
Matter insoluble in water	maximum percent, 1.0
Titer of the mixed fatty acids prepared from the soap	minimum, 39 C
Anhydrous soap content	minimum percent, 85.0

[1] Corresponds to Specification for Chip Soap, ASTM D496-51

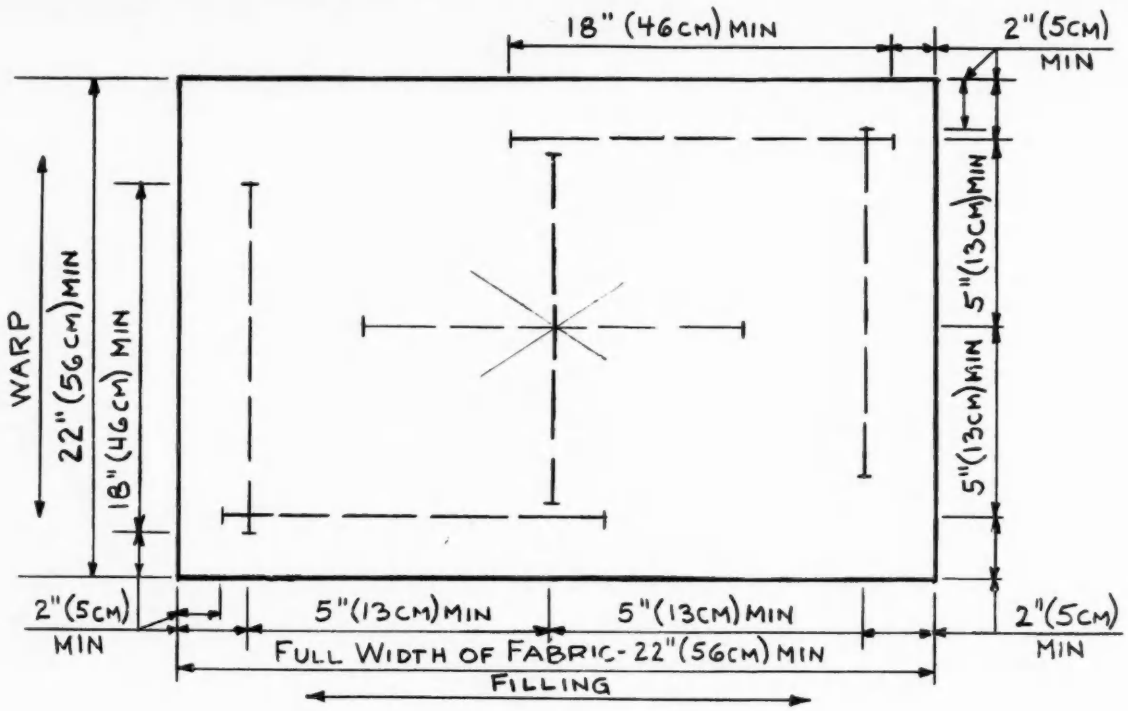
3.2 WATER———Soft water (not over 50 parts per million hardness[2]) should be used.

3.3 ANHYDROUS SODIUM CARBONATE

3.4 WASH WHEEL———A horizontal cylindrical machine with rotating cage and reversing mechanism is used. The cage should have a diameter within the range 16 in (40 cm) to 24 in (61 cm) and should have a peripheral speed of 164 to 180 feet per minute (50 to 55 meters per minute). Other diameters may be used as a temporary measure providing the speed of rotation is adjusted to give an equivalent peripheral speed. Preferably three (3) fins or "lifters" about 3 in (7.6 cm) wide equally spaced around the interior of the cage and extending its full length are used. However, either a single fin or 2 fins may be used providing equivalent results can be obtained. The cage turns at such a speed that the load is lifted by the fins and falls back into it. A peripheral speed of 176 feet (54 meters) per minute has been found satisfactory. The cage makes 5 to 10 revolutions before reversing its direction. The machine is equipped with heating facilities, such as live steam, gas or electricity, capable of raising the temperature of the water to 60°C (140°F) in 3 minutes including filling time and with an outlet large enough to permit discharge of all water from the machine in less than 2 minutes. A thermometer in a suitable well, or equivalent equipment, is provided for indicating the temperature of the water during the washing and rinsing. An outside water gage is provided for indicating the level of the water in the wheel.

The load to be run in the machine is 0.5 to 3.0 pounds of air-dry fabric per cubic foot of cage space (8 to 48 kilograms per cubic meter), including the volume of the fins. It is made up of test specimens and as much other similar fabric as required. The water used is sufficient to cover the load, but its depth is not to exceed ⅓ of the inside diameter of the cage.

[2] Hardness refers to the presence of such soap-precipitating compounds as calcium, magnesium, and iron salts in the water. It is expressed in various units, most of them based on equivalents of calcium carbonate. The table on page P220 may be used in converting hardness from one unit to another. Definitions of some of the various units used appear beneath the table.



Marking of Test Specimen

Table for converting expressions of water hardness*

	ppm	Gr/U S gal	Gr/Eng gal	Clark or English degrees	French degrees	German degrees
ppm	1	0.058	0.07	0.07	0.10	0.056
Gr/U S gal	17.1	1.00	1.2	1.2	1.71	0.958
Gr/Eng gal	14.3	0.829	1.00	1.00	1.43	0.80
Clark or English degrees	14.3	0.829	1.00	1.00	1.43	0.80
French degrees	10	0.583	0.70	0.70	1.00	0.560
German degrees	17.8	1.044	1.24	1.24	1.78	1.00

* Based on a table given in "Handbook of Chemistry and Physics," 35th Ed, Chemical Rubber Publishing Co, Cleveland, Ohio (1953).

ppm—parts of calcium carbonate per 1,000,000 parts of water.
Gr/U S gal—grains of calcium carbonate per US gallon of 58,381 grains of water.
Gr/Eng gal—grains of calcium carbonate per English gallon of 70,000 grains of water.
Clark or English degrees—grains of calcium carbonate per English gallon of 70,000 grains of water.
French degrees—parts of calcium carbonate per 100,000 parts of water.
German degrees—parts of calcium oxide per 100,000 parts of water.

3.5 EXTRACTOR———A laundry-type centrifugal extractor with perforated basket, or equivalent apparatus which does not distort the specimen, capable of reducing moisture retention to 50 to 60 percent, based on air-dry weight of the fabric, is used.

3.6 PRESSING EQUIPMENT———A flat bed press capable of pressing a specimen 22 inches (56 cm) square is preferred and is required in all cases of dispute. Otherwise, a hand iron may be used as an alternative. Either is to be capable of providing a pressure of 6.8 to 9.1 ounces per square inch (30 to 40 grams per square centimeter). The temperature of the press is 135 to 149 °C (275 to 300.2°F).

NOTE: Members are to consider for use in conjunction with the hand iron an aluminum plate 1 mm thick and of sufficient size to cover the specimen. (Proposed by the Netherlands).

3.7 MARKING EQUIPMENT———See "Test Specimen."

3.8 MEASURING SCALE———A rigid measuring rule, graduated in sixteenths of an inch (or millimeters) or directly in percent shrinkage (0.2% graduations) is used.

4) Test Specimen

4.1 The test specimen[3] is preferably the full width of the cloth by at least 22 in (56 cm) long but may have minimum dimensions, 22 in by 22 in square. It is cut, not torn, from the materials to be tested with its sides parallel to the warp and weft (filling). Condition it by exposure to the standard atmosphere[4] until in equilibrium with it. Lay it out without tension on a flat smooth surface being careful to see that it is free from wrinkles and creases. Mark off three measured distances, each at least 18 in (46 cm) parallel to the warp yarns and 3 parallel to the filling yarns. The measured distances are to be at least 5 in (13 cm) apart, and at least 2 in (5 cm) from any edge of the specimen. If possible, the measuring marks are to be staggered. The marks may be made with indelible ink and a fine-pointed pen, by sewing fine threads into the cloth, or other suitable method. (See illustration). A template or a mechanical device may be found helpful.

[3] Avoid the use of test specimens cut from within 1 yard (1 meter) of the end of the roll of cloth.

[4] For ISO/TC 38 purposes, the standard atmosphere in which physical tests on textile materials are performed has a relative humidity of 65 ± 2 percent and a temperature of 20° C ± 2° C (68° F ± 4° F). In tropical and subtropical countries the supplementary atmosphere for testing has a relative humidity of 65 ± 2 percent and a temperature of 27° C ± 2°C (81° F ± 4° F).

(*Concluded on page P240*)

Piedmont, Washington and Metropolitan Sections———

THE ANOMALOUS BEHAVIOR OF DIRECT DYES*

HENRY E MILLSON
Organic Chemicals Division, American Cyanamid Company
Bound Brook, NJ

INTRODUCTION

DIRECT dyes have been known and used extensively for many years for the coloring of cellulosic materials. At the present time, the textile industry consumes a greater quantity of these dyes each year than any other class of dyes, and their importance appears to be increasing because of their comparatively low cost, high tinctorial value and moderate-to-excellent fastness properties. Although the methods for applying direct dyes to rayon and cotton are extremely simple, inexplicable changes in shade and strength over which the dyer has no control often occur.

This poor reproducibility from batch to batch often has been attributed to insufficient control over variables, such as the presence of metal contaminants in the form of ions of aluminum, calcium, magnesium and iron; variations in the use of exhaustants, such as Glauber's or common salt; the types and amounts of standardizing agents; variable liquor ratios; and the incomplete removal of desizing agents. Without doubt, each of these factors does influence the result obtained but none of the variables mentioned can account completely for the magnitude of the differences which actually occur.

The present article is based on an experimental study undertaken to discover the factors causing the poor reproducibility obtained when cellulosic materials are dyed with direct dyes.

It has been known for many years that a variety of dyes decompose or are unstable in aqueous solutions at higher temperatures. For example, Basic Yellow 2 (*CI* 41000) in a dyebath becomes weaker with increasing temperature, and in time loses its color at temperatures above 160°F. Certain Acid Blues (113, 116, 118, and 120) and Acid Black 24 are destroyed by wool when a dyeing is boiled for several hours (*3*). The instability of certain direct dyes was observed and reported by Vickerstaff and Lemin (*2*); by Thomson (*4*) for Direct Red 75 (*CI* 25380); by Neale and Stringfellow (*1*) for Direct Red 2 (*CI* 23500) and Direct Yellow 12 (*CI* 24895); by Speakman and Clegg (*5*); and by Holmes and Standing (*6*) for Direct Orange 26 (*CI* 29150). Taylor (*8*) disclosed the reduction of direct dyes with resulting change in hue and loss in depth. Teichgraber (*11*) investigated the sensitivity of direct dyes in Permutit-softened water and found that many decomposed. Armfield (*14*) found that certain direct dyes were reduced in hot alkaline solutions. Schmitz (*9*) found that a few direct dyes show a tendency to undergo reduction at high temperatures. Vogel and Peters (*10*) discovered the deleterious effects of "overboiling" direct dyes at high temperatures.

During the course of the present experimental work, it was found that the number of direct dyes which deteriorate under normal dyeing conditions is far greater than has been recognized previously. Moreover, it was found that, while certain direct dyes actually decomposed in the dyebath, resulting in a decrease in color intensity of the dyed fabric, others produced an increase in color intensity of the dyed fabric with prolonged boiling even after a normal dyeing-time cycle had been completed. This increase in color intensity on the fabric will be referred to as "buildup." It was also found that the buildup or decomposition typical of certain dyes occurred whether the dye was alone or present with other dyes in the dyebath. In the light of these findings, it was believed that control of the above factors would assist in solving the problem of poor reproducibility presently obtained with direct dyes. Accordingly, extensive experiments were undertaken to find methods for controlling the decomposition of certain dyes and to find methods to accelerate the rate of dye buildup for those dyes exhibiting this property.

It was found from these experiments that the decomposition which certain dyes undergo on extended boiling in the dyebath could be controlled by the addition of selected salts to the dyebath. In particular, it was found that dye decomposition could be prevented or retarded by one of two procedures: a) by the addition of certain ammonium salts to the dyebath at the start of the dyeing cycle, and b) by periodic additions of common salt during the dyeing cycle.

Additionally, the rate of color buildup which occurred with certain dyes was markedly accelerated by the addition of the same ammonium salts which controlled dye decomposition. Thus, with the present data on decomposition and buildup properties of direct dyes and the effect of auxiliary chemicals on these properties, it is now possible to achieve reproducibility from batch to batch. For example, in the dyeing of cellulosic materials where a combination of direct dyes is required to produce a given shade, the dyer can combine dyes having divergent properties and still maintain control of the dyeing operation by adding auxiliary chemicals to the dyebath.

EXPERIMENTAL DYEINGS

More than one hundred direct dyes have been investigated to date, and of these 53 showed a loss of 5% or more, 29 increased in color value, while 28 showed little or no change over the six-hour boiling-period when the dyeings were made in porcelain beakers. These data were obtained by reflectance measurements of the dyed fabric using a Calco-modified General Electric Recording Spectrophotometer. A one-hour dyeing was used as the control and given a value of 100%.

The experimental data obtained in this study are based on Cyanamid dyes. However, it should be noted that similar dyes produced by other manufacturers had the same decomposition or buildup properties.

Except where noted, the dyeings used in this study were obtained by the following method:

*Delivered before the Piedmont Section, September 28, 1957; Washington Section, December 3, 1957; and the Metropolitan Section, February 7, 1958.

10.0 grams of either spun-viscose rayon, Bemberg rayon or cotton fabric;
0.5 to 2.0% direct dye (on weight of material);
10.0 common salt (on weight of material);
liquor ratio 40:1 using distilled water and dyed in porcelain beakers.

A master dyebath was prepared for two or more dyeings by adding the required amount of dye and common salt to the dyebath, followed by the addition of sufficient distilled water to bring the volume to 40:1. Four hundred milliliters of the master bath was then added to each beaker. This procedure was followed to eliminate the variables which might occur when solutions of dye and common salt are pipetted separately into each beaker.

A carefully wet-out and rinsed fabric was then placed in each dyebath and the beakers placed in a heating bath consisting of a concentrated solution of calcium chloride thermostatically controlled to maintain a temperature of 258°F. When the beakers were placed in this bath, the dyebath reached the boil in about fifteen minutes and a rolling boil was easily maintained throughout the dyeing cycle. After boiling one hour, one of the dyeings (which was used as a control) was removed, rinsed carefully in warm water, placed between sheets of paper towel, passed three times through a wringer, framed, and dried in an oven dryer for 15 minutes at 250°F. The remaining experimental dyeings were boiled continuously for the designated periods of time without further addition except for the necessary distilled water needed to maintain a 40:1 liquor ratio. They were then removed, rinsed, and dried in the same manner as the control.

It was observed during these studies that the presence of certain alkaline standardizing or solubilizing compounds in the dyebath can alter the decomposition, stability or buildup characteristics of the direct dyes shown in Table IV. Dyeings made in closed equipment showed a greater tendency to decompose than dyeings made in open equipment.

DYES WHICH DECOMPOSE

Calcodur Pink 2BL (*CI* 25380), a dye derived from diphenyl urea, was used as a typical example of a dye which decomposes when boiled in aqueous solution. The dyeings were carried out separately by boiling 10 grams of spun-viscose rayon fabric in a dye solution containing 1% Calcodur Pink 2BL and 10% common salt at a liquor ratio of 40:1. The reflectance values of six pieces of spun-rayon fabric dyed from one to six hours, respectively, are shown in Table I.

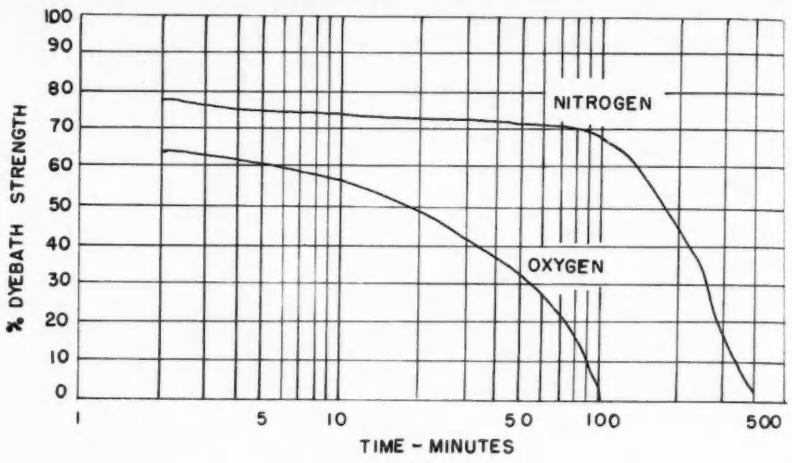


Figure 1
Dyeometer Dyeings

10.0 grams spun-viscose rayon yarn
1.0% Calcodur Pink 2BL
10.0% common salt
Liquor ratio, 40:1
Temperature, 210°F
Nitrogen Dyeing—starting pH 5.9; ending pH 6.4
Oxygen Dyeing—starting pH 5.9; ending pH 5.

TABLE I
Reflectance values

Dyeing time (hrs)	*Reflectance %*
1	100
2	86
3	80
4	76
5	67
6	58

In order to study this dye in greater detail, a series of dyeings was made in the Dyeometer (7) using 1% of dye and 10 grams of viscose-rayon yarn using nitrogen gas as the circulatory pump.

TABLE II
Dyeometer Dyeings

1.0% Calcodur Pink 2BL
10.0% common salt
Liquor ratio, 40:1
Nitrogen dyeing—starting pH 5.9; ending pH 6.4
Oxygen dyeing—starting pH 5.9; ending pH 5.8

Time		*Percent dye in bath*	
Hrs	*Mins*	*Nitrogen gas*	*Oxygen gas*
0	0	100	100
0	2	77	64
0	4	74	62
0	10	72	55
0	30	72	42
0	40	72	41
0	50	72	33
0	60	72	27
1	10	72	15
1	25	70	7
1	30	70	5
1	45	67	1
2	0	65	1
2	15	63	
2	30	60	
3	0	57	
3	30	55	
4	0	51	
4	30	48	
5	0	38	
5	30	26	
6	0	20	
6	30	13	
7	0	4	

The Dyeometer measures the "transmission" of the dyebath while the spectrophotometer measures the reflectance of the dyed fabric. Thus, using the Dyeometer, the transmission characteristics of the dyebath were measured during the dyeing cycle at various wavelengths, and recorded on specially designed paper in the form of a curve. As the concentration of dye in the bath changes, the curve also changes. Measuring the distance between the curves with a specially designed rule shows the percent change in concentration. It was found that the dye in the bath was almost completely decomposed within five hours at 210°F, but the yarn had only a tint of pink.

When the nitrogen was replaced with oxygen in another Dyeometer dyeing, the rate of decomposition was accelerated, complete destruction of the dye being obtained within two hours at 210°F. The yarn in this dyeing was colorless. The data in Table II show the percent loss in the dyebath strength for Calcodur Pink 2BL dyeings when nitrogen and oxygen gas, respectively, were used for circulating the dye liquor. These values are also shown in the curves in Figure 1.

Dyeings of Calcodur Pink 2BL were also run for one and six hours, respectively, at the boil on Bemberg rayon fabric. The decomposition characteristics exhibited by Pink 2BL when applied to Bemberg rayon were similar to those obtained with viscose.

DYEBATHS BOILED IN THE ABSENCE OF FABRIC———In view of

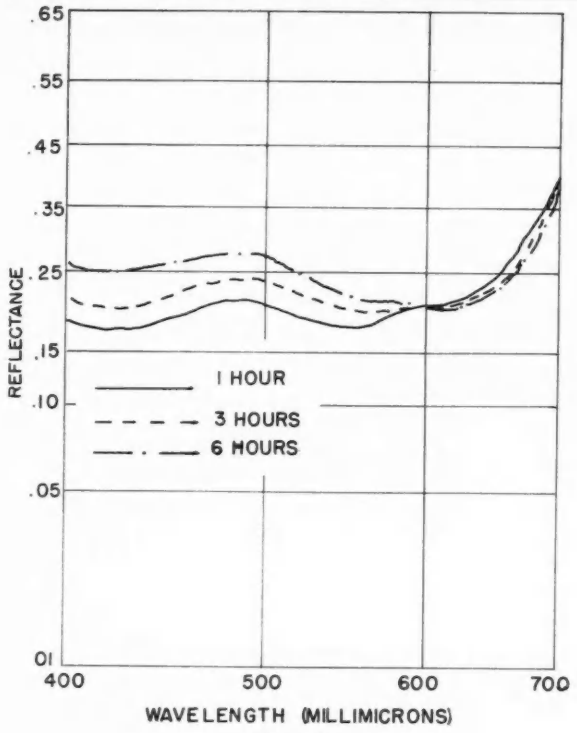


Figure 2
Combination Dyeings on Spun-Rayon Fabric

1.0% Calcodur Resin Fast Yellow R
1.0% Calcodur Resin Fast Red 6B
1.0% Calcodur Resin Fast Blue 2G
10.0% common salt
Liquor ratio, 40:1
Boiled one, three and six hours

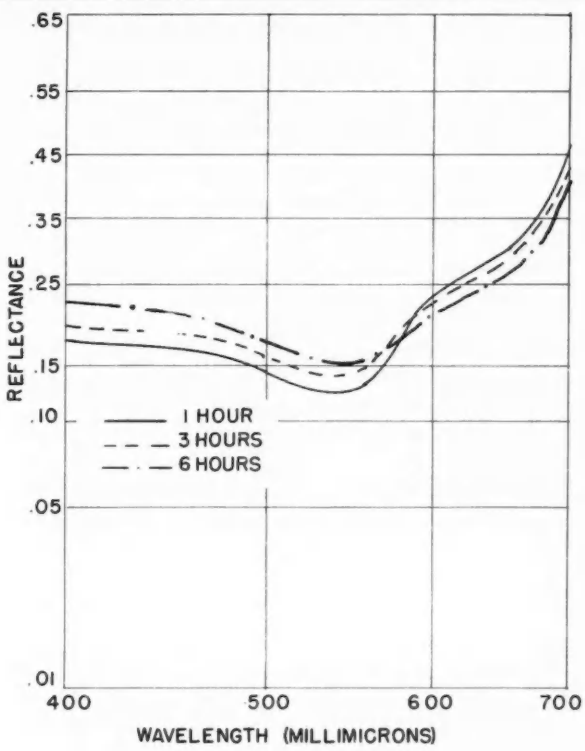


Figure 3
Dyeings made in "exhausted" dyebaths

10 grams spun-rayon fabric
10% common salt
Liquor ratio, 40:1
All dyeings boiled one hour

the above results, experiments were carried out to ascertain whether dyes in aqueous solution would decompose when boiled in normal dyebath concentrations in the absence of fabric. Dyebaths were made using 1% Calcodur Pink 2BL and 10% common salt (based on 10 grams of spun-viscose fabric) and boiled one, two, four and five hours respectively. The dyebaths were then brought back to volume and spun-rayon fabric was placed in each of the preboiled dyebaths and boiled for one hour along with a control dyeing made in a freshly prepared dyebath.

The dyeings showed that the dyebath which was boiled one hour before the fabric was introduced produced a dyeing slightly heavier in shade than the control. The dyeings made in the baths which were boiled two, four, and five hours, respectively, prior to the addition of the fabric were all much weaker than the control, and became weaker with increase in time of boiling prior to the addition of the fabric. These experiments show that Calcodur Pink 2BL decomposes in the absence of cellulosic materials when subjected to boiling temperatures for two hours or longer. The extent of the degradation of the dye is at least equal to that obtained when the fabric is present throughout the entire dyeing cycle.

DYES WHICH BUILDUP

Experiments have shown that 26% of the direct dyes tested produced dyeings on viscose rayon and on cotton which became progressively stronger as the time of dyeing at the boil was increased up to six hours. These experiments indicate that buildup may be the result of a) the solubilization of dye micelles or aggregates with prolonged heating of the dyebath, and b) the slow diffusion of the direct dye into the fiber. It is well known (*12*, *13*) that dyeings in which the dye is uniformly distributed among all of the fibers and each fiber is completely penetrated have greater color intensity than dyeings in which the dye is concentrated in rings on the outer parts of the fibers. Microscopical studies of cross sections of the dyed fibers in some of the buildup-dyeings herein referred to showed that the rate of diffusion for these dyes is often quite slow, and that fibers are still ring-dyed after boiling one to two hours. However, as the dyeing time was increased, continued diffusion of the dye resulted in completely dyed fibers. The depth of shade also increased with time.

TABLE III

1.0% Direct Fast Rubine CA
10.0% common salt
Dyed on 10 grams spun-viscose rayon fabric
Liquor ratio, 40:1

Time of boiling (hours)	*Color intensity as determined by spectrophotometric reflectance readings (%)*
1	100
2	160
3	194
4	205
5	212
6	222

For example, 1% dyeings of Direct Fast Rubine CA (*CI* 28395) on spun-viscose rayon fabric increased in strength from 100%, after one hour at the boil, to 222% after six hours at the boil. Table III shows spectro-

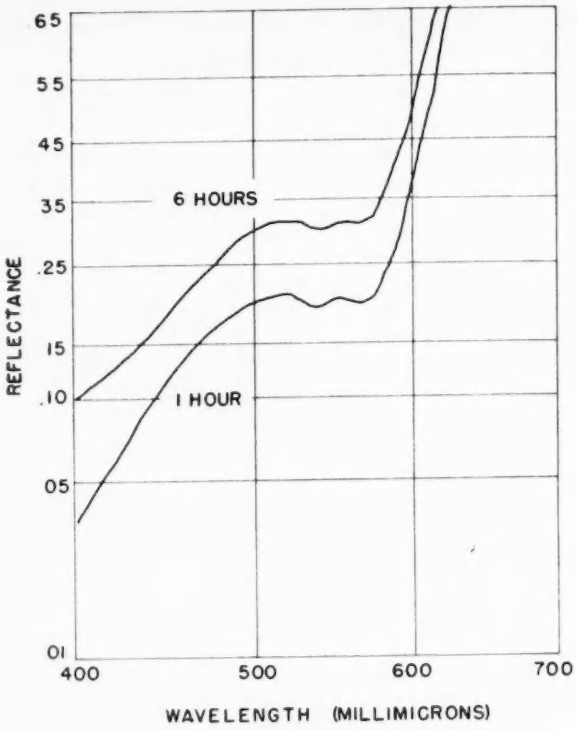


Figure 4
Combination dyeings on spun-viscose rayon

1.0% Calcodur Resin Fast Yellow R
1.0% Calcodur Pink 2BL
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

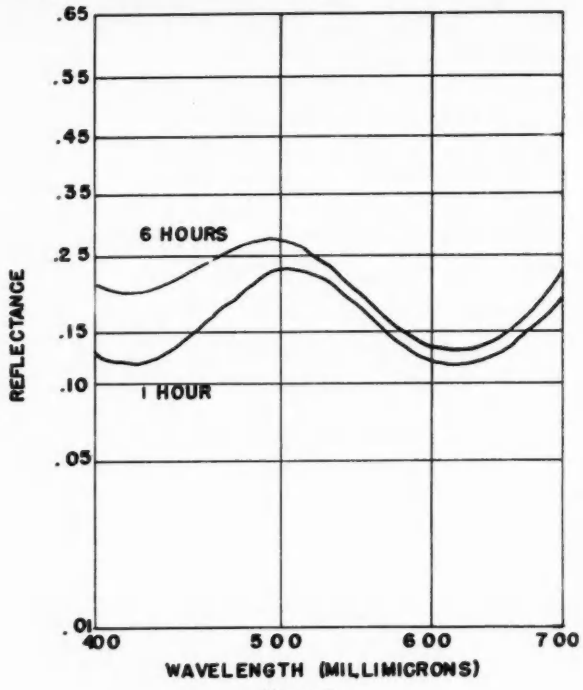


Figure 5
Combination dyeings on spun rayon

1.0% Calcodur Resin Fast Yellow R
1.0% Calcodur Blue 4GL
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

photometric reflectance measurements made on these dyeings. As was expected, microscopical examination showed the normal ring-dyeing in the early stages and completely and uniformly dyed fibers as the boiling time was increased to between one and two hours. However, an unexpected feature of these dyeings appeared as the boiling time was increased to four, five and six hours. The dye which was uniformly distributed throughout the fiber after one and one-half hours at the boil became concentrated in the core of the fiber after five hours leaving undyed outer areas. These changes are shown in Color Plate B, Figs 1, 2 and 3. This phenomenon of dye concentration in the core after prolonged boiling is not common to all dyes. For example, Calcodur Red 8BL (*CI* 28160) and Calcomine Brilliant Yellow Conc (*CI* 24895) did not exhibit this change when boiled for the same time periods, as shown in Color Plate B, Figs 4 and 5.

One-percent dyeings of the Direct Fast Rubine CA were also made on Bemberg rayon fabric. This dye produced a heavier dyeing after boiling six hours than after boiling one hour. The buildup was less, however, than on viscose rayon. This is about as expected since the rate of dyeing for Bemberg is generally quite rapid due to the smaller diameter of the fibers, which results in a greater surface area being exposed to the dyebath. Consequently, there is a more rapid rate of dye absorption from the bath. The color strength of the six-hour dyeing compared to the one-hour dyeing on Bemberg rayon was 120% while the six-hour dyeing compared to the one-hour dyeing on viscose rayon was 222%.

DYES WHICH ARE STABLE

Of the direct dyes tested to date, twenty-eight of them were stable to decomposition but did not buildup when applied on spun rayon. These dyes showed no significant change in strength or hue on spun-viscose rayon fabric after continuous boiling for six hours. Fortunately, some of these stable dyes are among the newest and best which are available at the present time. Twenty-three of these stable dyes are listed in Table IV.

COMBINATION DYEINGS

Most shades are made with a combination of two or more dyes and, therefore, in any given formula allowance must be made for the decomposition or buildup which occurs with certain dyes. The comprehensive list of dyes shown in Table IV has been prepared for the dyer as a reference guide to assist him in predicting the dyeing behavior of each dye in a given formula. The dyeings used for spectrophotometric reflectance measurements in this study were obtained by using commercial types of direct dyes as sold to the trade. In the classification, dyes which lose 6% or more color strength after boiling six hours are listed as dyes which decompose, while those which increase in strength beyond 105% are listed as dyes which buildup. Those dyes having between 95% and 105% of their one-hour color strength after being boiled six hours are listed as stable dyes.

It is important to understand the individual characteristics of these dyes not only when they are used alone but also when they are used in combination with each other. An understanding of the individual characteristics of dyes used in producing a combination shade is particularly im-

TABLE IV

Properties of direct dyes based on 1% dyeing on spun-viscose rayon fabric (Dyed at 212°F; 10% common salt on all dyeings; liquor ratio, 40:1)

	Old Colour Index or Prototype Number	*New Colour Index Number*	*Strength and shade by reflectance of dyeings boiled six hours versus dyeings boiled one hour*	*Strength and shade by reflectance of dyeings boiled six hours with 5% ammonium thiocyanate versus dyeings boiled six hours without ammonium thiocyanate*	*Strength and shade by reflectance of dyeings boiled one hour with 5% ammonium thiocyanate versus dyeings boiled one hour without ammonium thiocyanate*	*Difference in shade between bone-dry and conditioned control one-hour dyeings*	*Shade change in artificial light*	*Temperature of maximum exhaustion (° F)*	*Fastness to light on viscose rayon—Fade-Ometer ratings*
A) DYES WHICH DECOMPOSE									
Calcodur Pink 2BL	353	25380	58% yellower	275% sl brighter	180% v sl brighter	sl yellower	yellower	140	6
Calcodur Yellow 4GL	346	25300	58% similar	100% greener	90% greener	sl redder	sl redder	140	5
Calcodur Violet 4RL	—	—	58% sl duller	108% duller	112% sl duller	weaker duller less blue	much redder sl duller	140	6-7
Chlorantine Fast Violet 2RL	Pr 491	29225	61% sl duller	147% sl duller	145% similar	sl weaker	brighter	100	6-7
Calcodur Resin Fast Yellow R	Pr 582	29025	68% sl redder sl duller	180% v sl brighter	150% v sl brighter	sl bluer thinner sl redder	yellower sl redder	140	6
Calcomine Scarlet 3B	382	22240	72% sl duller	143% sl brighter	135% sl brighter	much yellower	brighter yellower	100	4
Calcodur Resin Fast Red 6B	Pr 428	29065	74% similar	152% similar	140% similar	much yellower	brighter yellower	180	6-7
Calcoform Black RN Double Conc	Pr 372	35435	75% sl redder	28% brown destroyed	20% brown destroyed	much redder	sl greyer sl redder	180	7 full shade
Calcomine Brill Violet B Conc	Pr 35	27855	76% sl duller	135% similar	122% similar	much redder	much redder	140	3
Calcodur Resin Fast Orange 5G Conc	Pr 578	—	76% v sl yellower	122% similar	115% similar	much yellower	sl brighter redder	180	5-6
Calcomine Fast Orange 2R	326	29165	79% sl duller	118% v sl brighter	110% v sl brighter	yellower	brighter sl yellower	105	5-6
Calcodur Turquoise GL	Pr 278	74180	80% duller	110% sl redder	95% v sl redder	similar	greener	180	5
Calcodur Blue 8GL	Pr 27	—	82% v sl duller	163% v sl brighter	140% v sl brighter	much redder	greener	180	5
Calcodur Blue SL	Pr 71	34140	82% similar	150% v sl brighter	123% similar	much duller redder	duller redder	140	7
Calcodur Resin Fast Blue 2R	Pr 613	—	82% sl duller	132% v sl brighter	142% v sl brighter	similar	duller redder	140	6-7
Calcomine Brown B	561	35660	82% sl duller	105% sl yellower	105% sl yellower	v sl brighter v sl redder	brighter more orange	180	2
Calcodur Orange TGL	Pr 72	40215/20	83% similar	159% similar	140% similar	v sl redder	brighter sl redder	—	5-6
Calcodur Green BL	Pr 452	34045	83% sl yellower sl duller	155% v sl brighter v sl bluer	139% v sl brighter v sl bluer	much bluer	sl brighter sl yellower	180	6
Calcomine Scarlet YA	326	29165	85% sl duller	123% v sl yellower	125% v sl yellower	much yellower	much brighter yellower	140	4-5
Calcomine Diazo Black BHD	401	22590	86% sl duller	117% v sl brighter	120% v sl brighter	much redder	duller redder	160	3
Calcomine Sky Blue FF Ex Conc	518	24410	87% sl duller	118% v sl brighter	123% v sl brighter	much redder	much greener	100	5-6
Calcomine Catechu 2B Conc	561	35660	87% v sl duller	95% sl yellower	93% sl yellower	sl brighter thinner	brighter more orange	180	2
Calcomine Diazo Black VJ Conc Diazotize and Develop MTD	Pr 202	30015	87% sl redder	110% sl redder	116% v sl redder	v sl duller greener	greener	—	7 full shade
Calcomine Scarlet 4BSY	327	29160	87% sl duller	110% similar	109% v sl brighter	much yellower	much brighter yellower	180	5
Diamine Bordeaux B	Pr 67	22155	87% sl duller	108% duller	115% sl duller	yellower	much brighter yellower	140	6
Calcomine Congo Red 4BX Conc	370	22120	88% sl duller	107% duller	109% duller	much brighter yellower	brighter yellower	140	3
Calcomine Scarlet 4BNC	326	29185	88% sl duller	120% v sl yellower	127% similar	much yellower	much brighter yellower	—	4
Calcodur Resin Fast Blue R	Pr 443	23155	88% sl duller	110% similar	105% similar	sl duller	redder much duller	212	6-7
Calcomine Green GN Conc	594	30315	88% v sl yellower v sl duller	130% sl brighter sl bluer	120% v sl brighter v sl bluer	much bluer	brighter yellower	180	5
Calcomine Brown M	420	22311	88% sl duller	100% similar	105% similar	brighter redder	redder much brighter	100	5
Brilliant Benzo Fast Violet BL	325	27905	89% v sl duller	110% similar	121% similar	extremely red	much redder	140	6
Calcodur Resin Fast Blue 3G Conc	—	—	90% sl duller	132% similar	140% sl brighter	v sl duller redder	duller greener	180	6
Benzo Blue 3B	447	23850	90% v sl duller	140% similar	135% similar	redder duller	duller greener	160	3
Calcomine Navy R	569	31875	90% similar	122% similar	146% similar	duller sl redder	duller sl redder	140	5-6
Calcomine Garnet B	375	22145	90% v sl duller	112% sl bluer	116% v sl bluer	much yellower	much brighter yellower	180	5
Chloramine Green B	589	30290	90% v sl duller	115% similar	115% similar	much bluer	sl yellower	212	5
Calcomine Yellow Brown K Ex	596	30045	90% duller	30% duller destroyed	35% duller destroyed	lighter yellower	brighter redder	140	3
Calcomine Red 4BX Conc	448	23500	91% v sl duller	105% v sl duller	106% similar	much yellower	much brighter yellower	180	3
Calcomine Red FC	419	22310	92% v sl yellower	94% sl duller	100% v sl duller	sl fuller sl duller	much brighter yellower	100	7
Calcomine Catechu 3RS	—	—	92% sl duller	100% sl yellower	100% sl yellower	sl yellower	sl brighter sl redder	140	4
Calcomine Catechu 4G Conc	Pr 70	36300	92% sl duller	100% v sl duller	108% v sl duller	v sl yellower	brighter redder	212	4-5
Calcomine Diazo Black OBD Direct	Pr 147	31600	92% v sl greener	126% v sl brighter	135% v sl brighter	duller greyer	sl duller sl redder	—	3
Direct Brilliant Cerise	Pr 32	29105	93% sl duller	113% similar	111% similar	extremely yellower	much brighter much yellower	180	6
Calcomine Black R 200%	582	30245	93% similar	103% much redder	93% much redder	duller greener	slightly greener	140	6
Calcomine Black 200%	581	30235	94% similar	110% much redder	105% much redder	duller greener	slightly greener	160	6

TABLE IV (concluded)

	Old Colour Index or Prototype Number	New Colour Index Number	Strength and shade by reflectance of dyeings boiled six hours versus dyeings boiled one hour	Strength and shade by reflectance of dyeings boiled six hours with 5% ammonium thiocyanate versus dyeings boiled six hours without ammonium thiocyanate	Strength and shade by reflectance of dyeings boiled one hour with 5% ammonium thiocyanate versus dyeings boiled one hour without ammonium thiocyanate	Difference in shade between bone-dry and conditioned control one-hour dyeings	Shade change in artificial light	Temperature of maximum exhaustion (° F)	Fastness to light on viscose rayon — Fade-Ometer ratings
B) DYES WHICH ARE STABLE									
Calcomine Brilliant Yellow Conc	365	24895	95% v sl duller	150% similar	116% similar	sl weaker	brighter redder	100	6
Calcomine F Red 8B	Pr 246	35780	95% sl duller	155% v sl bluer	140% v sl bluer	similar	brighter yellower	140	6–7
Calcomine Garnet BY	375	22145	95% sl duller	100% sl duller bluer	116% duller bluer	much yellower	much brighter yellower	180	5
Diamine Brown B	423	22345	96% sl duller	110% similar	110% similar	much redder	brighter more orange	180	2–3
Calcodur Blue Green BG	Pr 470	—	96% sl duller	133% v sl brighter	155% v sl brighter	much bluer	brighter yellower	212	6
Calcodur Resin Fast Grey 2G	—	—	98% v sl duller	163% v sl bluer	170% v sl bluer	v sl duller	sl bluer sl redder	180	6
Calcodur Red 8BL	278	28160	97% sl duller	130% similar	133% similar	sl yellower	brighter yellower	140	6
Calcodur Resin Fast Blue 6G	Pr 432	—	97% v sl duller	110% similar	126% v sl brighter	v sl duller	sl duller greener	180	6
Calcomine Blue DR	—	—	98% v sl duller	185% v sl brighter	185% v sl brighter	v sl duller v sl redder	duller sl redder	180	3–4
Calcomine Scarlet 8BC Ex	326	29165	99% v sl duller	130% similar	130% similar	much yellower	much brighter yellower	180	4
Calcomine Azurine BT Conc	502	24140	99% v sl duller	112% similar	116% similar	violet much redder	duller much redder	180	5
Calcomine Silk Orange RN Conc	415	22130	100% similar	98% v sl duller	102% v sl duller	much yellower	brighter sl redder	110	4–5
Calcodur Brown BRL	Pr 47	30145	100% sl yellower	100% uneven adversely affected bluer duller	150% uneven adversely affected bluer duller	v sl duller v sl yellower	sl brighter yellower	212	6
Calcomine Fast Black F Conc	509	—	100% similar	100% sl duller	105% sl duller	duller redder	duller redder	180	3–4
Benzo Rhoduline Red B	Pr 31	29100	101% v sl duller	113% v sl brighter	120% v sl brighter	extremely yellow	brighter yellower	100	3
Calcodur Orange EGL	Pr 72	40215/20	102% sl duller	132% similar	130% similar	similar	brighter sl redder	212	6
Direct Brown 4RL	—	—	102% v sl duller	118% v sl duller	120% similar	extremely yellow	much brighter redder	212	7
Cotton Black 3G	Pr 64	31665	102% similar	115% similar	110% similar	sl heavier sl redder	sl greener	140	4
Calcomine Green BY Conc	593	30295	103% sl duller	117% v sl brighter v sl bluer	120% v sl brighter v sl bluer	bluer	brighter yellower	212	5–6
Calcomine Violet N	394	22570	104% sl duller	122% v sl brighter	137% v sl brighter	sl duller sl bluer	much redder	100	6
Direct Fast Orange 2RL	—	—	105% similar	115% v sl brighter	130% v sl brighter	v sl duller v sl yellower	brighter sl redder	180	4
Calcodur Resin Fast Blue 2G	Pr 612	—	105% sl duller	185% v sl brighter	135% v sl brighter	sl weaker sl duller	duller greener	180	6–7
Calcomine Dark Green BG Conc	583	30280	105% v sl yellower	107% similar	128% similar	duller bluer	yellower	212	5–6
C) DYES WHICH BUILDUP									
Calcomine Brilliant Violet 2R	—	—	106% v sl yellower	140% v sl brighter	140% v sl brighter	extremely red	brighter much redder	100	3
Calcomine Diazo Black BTCW	401	22590	106% v sl duller	115% similar	120% similar	redder duller	duller redder	160	7 full shade
Calcodur Grey L	Pr 24	22720	107% similar	123% v sl bluer	114% v sl bluer	duller sl redder	greyer redder	70	4
Calcomine Chinoline Yellow P	Pr 533	—	108% similar	140% similar	130% similar	sl fuller brighter	brighter v sl redder	180	2
Calcodur Orange GL	653	22375	110% sl yellower	130% yellower	130% yellower	lighter yellower	brighter redder	140	5
Diamine Fast Orange EG	Pr 72	40215/20	115% similar	140% v sl brighter	140% v sl brighter	yellow sl weaker	brighter sl redder	140	4
Direct Fast Orange ERB	Pr 73	40265	115% v sl duller	140% v sl brighter	140% v sl brighter	yellower	brighter redder	180	5
Calcodur Yellow BL	814	19556	116% sl greener	108% similar	108% similar	weaker sl redder	brighter sl redder	212	5–6
Calcomine Scarlet B	382	22240	116% sl yellower	135% v sl bluer	135% v sl bluer	much yellower	brighter yellower	70	4–5
Calcomine Brilliant Paper Yellow Conc	364	24890	120% v sl greener	135% sl brighter	138% sl brighter	weaker sl redder	brighter sl redder	100	4–5
Calcodur Yellow NN Conc	814	19556	120% sl greener	115% similar	120% similar	similar	brighter redder	180	5–6
Calcodur Blue 4GL	533	34200	123% similar	122% v sl brighter	137% v sl brighter	duller redder	duller sl redder	140	6
Calcomine Brilliant Violet BN Conc	Pr 35	27885	127% v sl brighter	122% v sl brighter	125% v sl brighter	extremely red	much redder	140	5–6
Calcodur Orange ERL	Pr 73	40265	132% v sl duller	120% v sl brighter	120% v sl brighter	much yellower	sl brighter sl redder	212	5
Calcomine Yellow 6G	622	40001 40006	132% sl redder	195% similar	182% similar	sl weaker	brighter sl redder	180	1–2R
Calcomine Yellow 8G	622	40001 40006	140% v sl duller	145% v sl brighter	165% v sl brighter	sl weaker	brighter sl redder	180	1–2R
Direct Oreange G	—	—	143% similar	165% v sl brighter v sl yellower	145% v sl brighter v sl yellower	much yellower	sl brighter sl redder	180	3
Calcomine Yellow 7G	622	40001 40006	145% sl redder	174% v sl brighter	193% v sl brighter	sl weaker	brighter sl redder	180	1–2R
Calcomine Yellow AD	—	—	150% v sl greener	127% similar	132% similar	sl heavier	sl brighter v sl redder	160	2R
Calcomine Orange 5RE	621	40002 40003	153% similar	190% v sl brighter	200% v sl brighter	much yellower	sl brighter sl redder	212	3–4
Calcomine Yellow 2G	620	40000	160% v sl redder	205% similar	160% similar	weaker sl redder	sl brighter sl redder	140	2
Mikado Yellow	622	40001 40006	168% similar	195% similar	165% similar	sl weaker sl greener yellower	brighter sl redder	140	2R
Calcomine Yellow AF	622	40001 40006	170% similar	205% sl brighter	185% sl brighter	sl weaker	sl brighter sl redder	140	2R
Calcomine Orange R Spec	621	40002 40003	193% similar	175% sl brighter	158% sl brighter	weaker yellower	sl brighter sl redder	212	5
Direct Fast Rubine CA	Pr 539	28395	222% sl bluer	132% similar	152% similar	yellower	much brighter yellower	212	5–6

Color Plate A

A Dye Which Decomposes

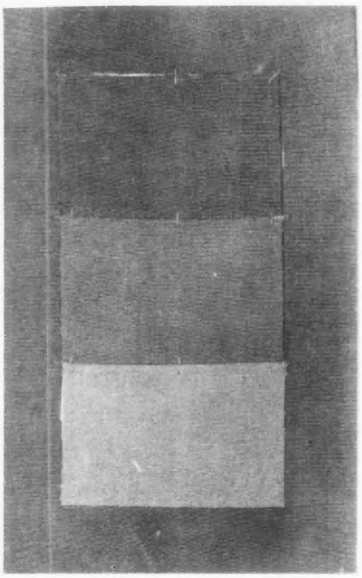


Fig. 1
1.0% Calcodur Pink 2BL
10.0% Common Salt

A Stable Dye

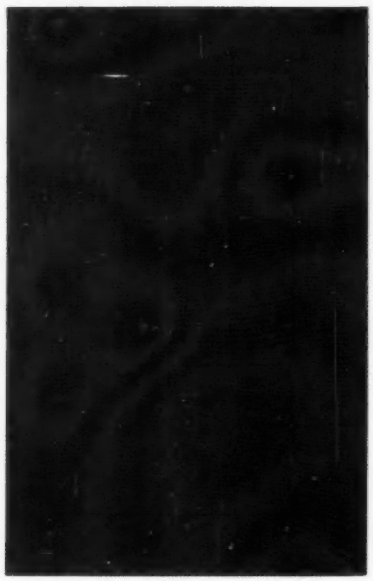


Fig. 2
1.0% Calcodur Resin Fast Grey 2G
10.0% Common Salt

A Dye Which Builds up

Fig. 3
1.0% Direct Fast Rubine CA
10.0% Common Salt

Yellow Decomposes—Blue Builds up

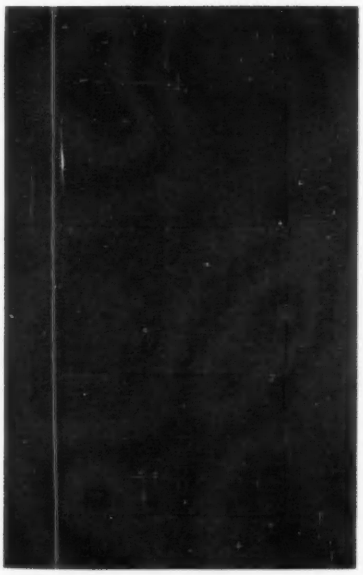


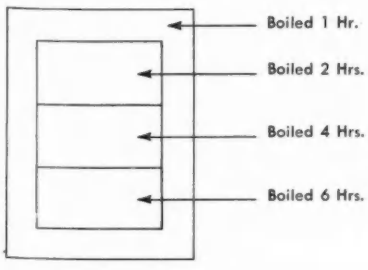
Fig. 4
1.0% Calcodur Yellow 4GL
1.0% Calcodur Blue 4GL
10.0% Common Salt

Dyes Which are Stable

Fig. 5
1.0% Calcodur Brown BRL
0.75% Calcodur Resin Fast Blue 2G
0.75% Calcodur Resin Fast Grey 2G
10.0% Common Salt

Dyes Which Build up

Fig. 6
1.0% Direct Fast Rubine CA
1.0% Calcodur Orange ERL
10.0% Common Salt



1.0% Direct Fast Rubine CA 10.0% Common Salt

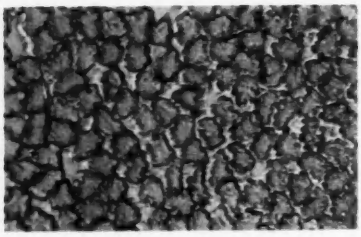


Fig. 1
Boiled 30 Min. Ring Dyed

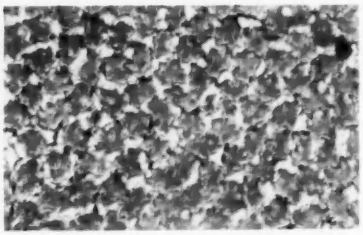


Fig. 2
Boiled 1¼ Hrs. Completely Dyed

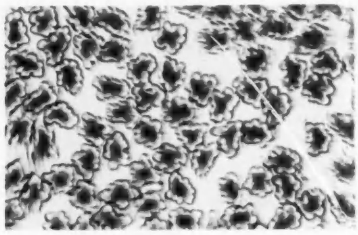


Fig. 3
Boiled 6 Hrs. Core Dyed

1.0% Calcomine Brilliant Yellow Conc. 10.0% Common Salt

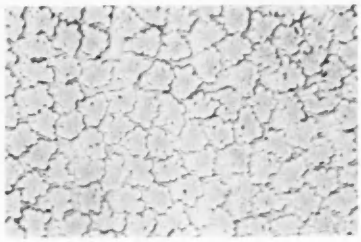


Fig. 4
Boiled 1 Hr. Completely Dyed

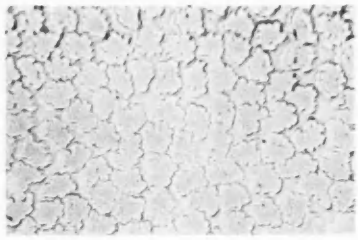


Fig. 5
Boiled 6 Hrs. Completely Dyed

A Dye Which Decomposes

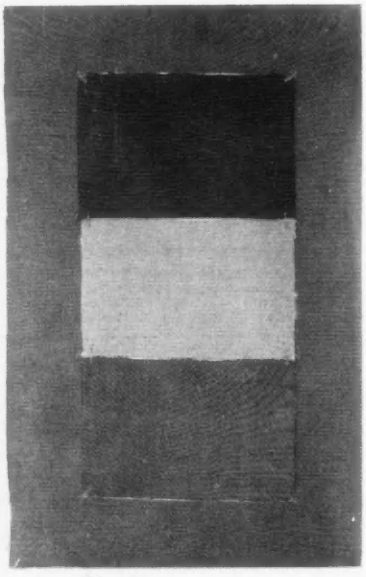


Fig. 6
1.0% Calcodur Pink 2 PL
10.0% Common Salt

A Stable Dye

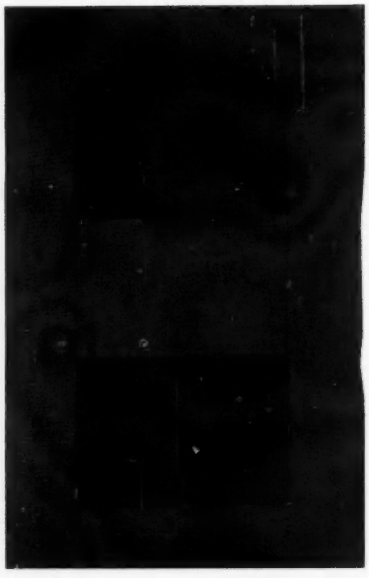
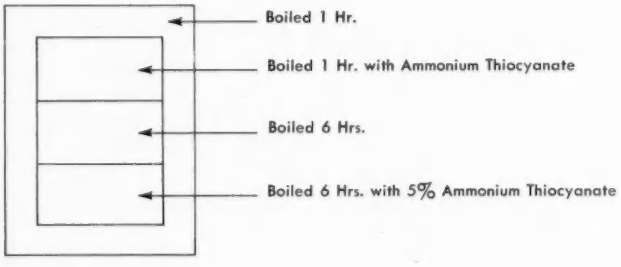


Fig. 7
1.0% Calcodur Resin Fast Grey 2G
10.0% Common Salt

A Dye Which Builds up

Fig. 8
1.0% Calcomine Yellow 2G
10.0% Common Salt



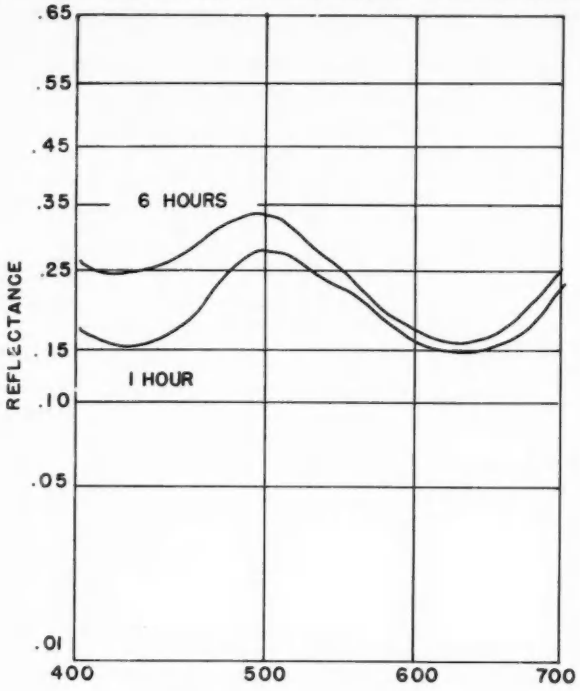


Figure 6
Combination dyeings on cotton fabric.

1.0% Calcodur Resin Fast Yellow R
1.0% Calcodur Blue 4GL
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

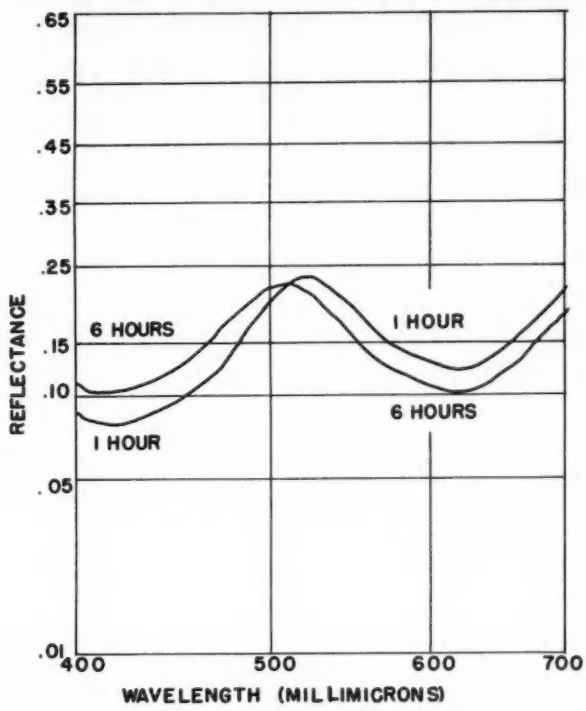


Figure 7
Combination dyeings on spun-rayon fabric

1.0% Calcodur Yellow 4GL
1.0% Calcodur Blue 4GL
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

portant for dyeing automotive fabrics, where dyeing cycles of six to fourteen hours are not uncommon and where exactness of match is mandatory.

A number of combination dyeings was made on spun-viscose rayon, and on cotton fabrics to test the validity of the data shown in Table IV, and some of these studies will be described in detail to illustrate the changes which occur.

A series of seven separate dyeings was made on spun-viscose rayon, each in a dyebath which was an aliquot portion of a master bath containing 10% common salt and one percent each of Calcodur Resin Fast Yellow R (*CI* 29025), Calcodur Resin Fast Red 6B (*CI* 29065), and Calcodur Resin Fast Blue 2G (Pr 612) diluted to a liquor ratio of 40:1. A dyeing was removed after 1, 2, 3, 4, 5, 6 and 7 hours, respectively, of continuous boiling during which time periodic additions of boiling distilled water were made to compensate for evaporation and to maintain the 40:1 liquor ratio. Upon completion, the dyeings were removed and a fresh piece of spun-rayon fabric was placed in the "exhausted" dyebath with an addition of 10% common salt. These "exhaust" dyeings were boiled one hour.

Examination of the dyeings boiled from 1 to 7 hours showed that no two of them were similar in shade. In particular, as the dyeing time increased, the shade lost redness and yellowness. Moreover, examination of the "exhaust-bath" dyeings showed that no two of them were identical in shade, and the longer the original dyeing had been boiled in the bath, the less yellow and red remained in the shade of the "exhaust" dyeing. Since an increase in time at the boil caused the dyeings to lose color value, and the dyes were not present in the "exhausted" dyebaths, it was obvious that the yellow and red dyes were disappearing from the bath or the fabric or both during prolonged boiling. An inspection of the data in Table IV indicated that this would occur. A family of spectrophotometric reflectance curves was prepared from the original dyeings and also from the dyeings made in the "exhausted" dyebaths. These curves show the considerable change in shade which took place during protracted boiling. (See Figures 2 and 3). This change in shade was caused by a loss of yellow and red but no loss of blue. This proves that the yellow and red dyes were unstable to prolonged boiling while the blue dye remained unaffected. Additional dyeings were run on the individual dyes, and spectrophotometric analyses were made on both the dyeings and the "exhausted" dyebaths. These analyses confirmed the fact that a loss of yellow dye had occurred, and that decomposition of the dye started during the first hour at the boil. Decomposition of the red dye began between the second and third hours at the boil, and continued with increasing time. The blue dye, however, was stable to prolonged boiling. A duplicate series of dyeings was run in exactly the same manner as previously described except the temperature was maintained at 190°F instead of 212°F. The decomposition of the yellow and red dyes was slower and less extensive, but a definite shade change resulting from dye decomposition did occur even at this lower temperature.

A combination dyeing was made with 1% Calcodur Pink 2BL and 1%

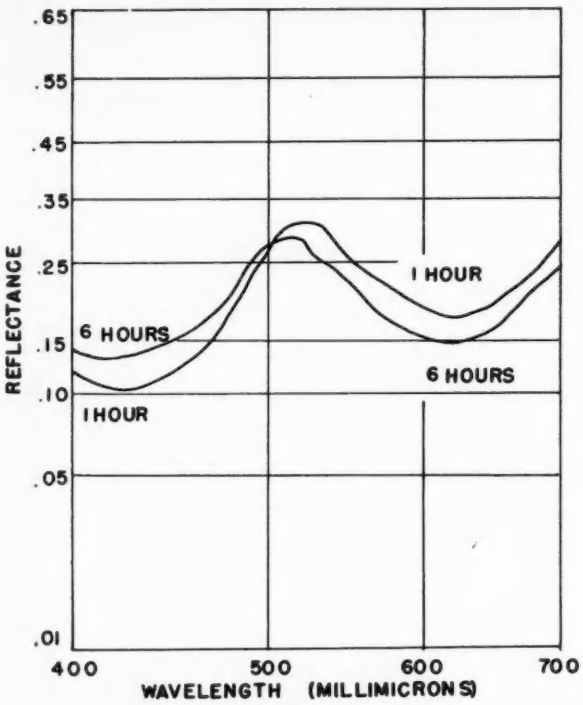


Figure 8
Combination dyeings on cotton fabric

1.0% Calcodur Yellow 4GL
1.0% Calcodur Blue 4GL
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

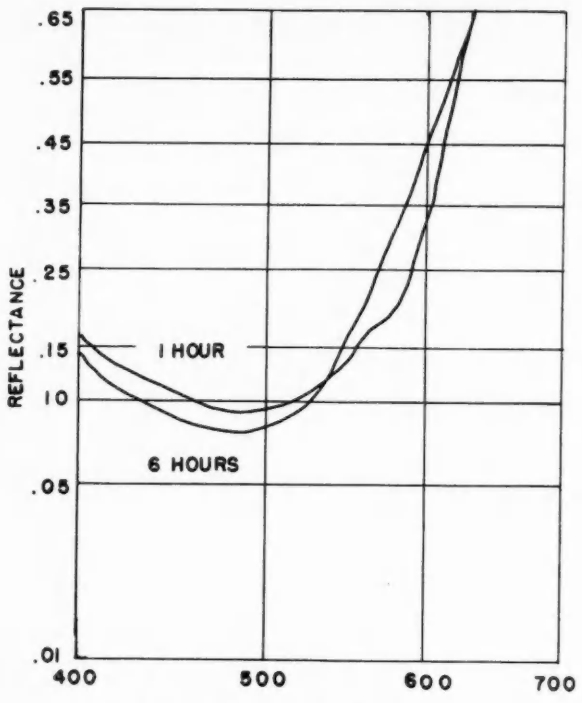


Figure 9
Combination dyeings on spun-rayon fabric

1.0% Calcodur Pink 2BL
1.0% Calcodur Orange ERL
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

Calcodur Resin Fast Yellow R, two dyes which decompose and progressively lose strength on continued boiling. Figure 4 shows spectrophotometric reflectance curves of the one- and six-hour dyeings. Using the dyeing boiled one hour as 100%, the dyeing boiled six hours is only 45% as strong and is less red because the Pink 2BL decomposes to a greater extent than the Yellow R under these conditions. Dyeings were then made to determine the possibility of increasing the amount of each dye so that a dyeing boiled for six hours would match a dyeing boiled for one hour. This was, in fact, accomplished by using 1.8% Calcodur Resin Fast Yellow R and 1.9% Calcodur Pink 2BL. This indicates that the data in Table IV are useful for adjusting the amounts of dye required to produce a match, once the approximate time of the dyeing cycle is known.

A combination shade made with 1% Calcodur Resin Fast Yellow R, which decomposes, and 1% Calcodur Blue 4GL (*CI* 34200), a dye with buildup properties, should produce a yellowish green shade when boiled one hour and, as boiling is continued, the shade should become less yellow and much bluer. This is exactly what did occur with dyeings made on both rayon and cotton fabrics, as can be seen from Figures 5 and 6.

A similar loss of yellow occurs on both rayon and cotton when 1% Calcodur Yellow 4GL (*CI* 25300), a dye which decomposes, and 1% Calcodur Blue 4GL, a dye which builds up, are used in combination. Figures 7 and 8 show reflectance curves for one- and six-hour dyeings.

It was predicted that a combination shade made with 1% Calcodur Pink 2BL and 1% Calcodur Orange ERL (*CI* 40265) would be a reddish orange after one hour of boiling, and would become progressively yellower with an increase of time at the boil since Pink 2BL decomposes and the Orange ERL becomes stronger, as can be seen from the data in Table IV. Figures 9 and 10 are spectrophotometric reflectance curves of the one- and six-hour dyeings and confirm the above prediction.

Table IV also shows that Calcodur Orange EGL (*CI* 40215/20), Calcodur Brown 4RL and Calcodur Resin Fast Grey 2G do not change appreciably during boiling, and therefore, should produce approximately similar shades for one- and six-hour dyeings. This did happen as is shown by the spectrophotometric reflectance curves in Figure 11.

A combination shade, made with 0.5% Calcodur Yellow NN (*CI* 19555), 0.5% Calcodur Orange ERL, and 0.5% Calcodur Resin Fast Blue 2G, was expected to become progressively more orange with increased time at the boil since both the orange and yellow dyes increase in color strength while the Blue 2G shows practically no change. The spectrophotometric reflectance curves of Figure 12 confirm this expectation.

A combination shade using 1% Calcodur Orange ERL and 1% Direct Fast Rubine CA was dyed on spun-viscose rayon by boiling one hour. From a knowledge of the data in Table IV, which shows that these dyes become stronger with continued boiling, it should be possible to match this one-hour dyeing by using proportionately less of these dyes and boiling for six hours. The spectropho-

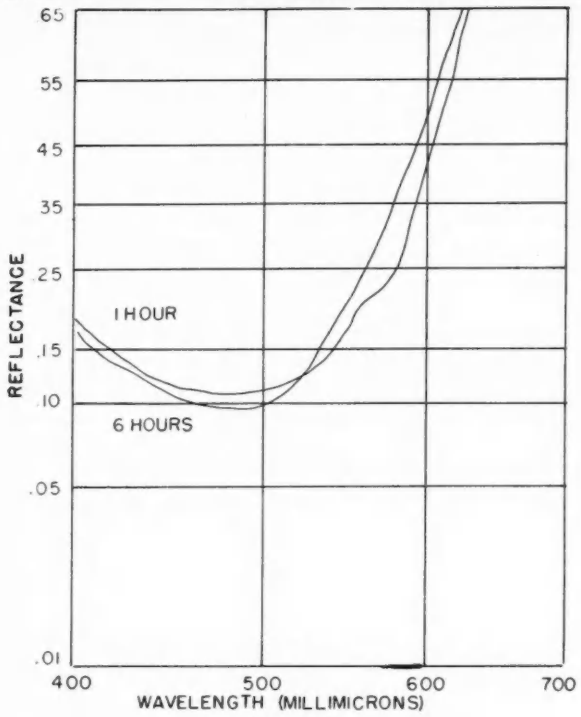


Figure 10
Combination dyeings on cotton fabric

1.0% Calcodur Pink 2BL
1.0% Calcodur Orange ERL
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

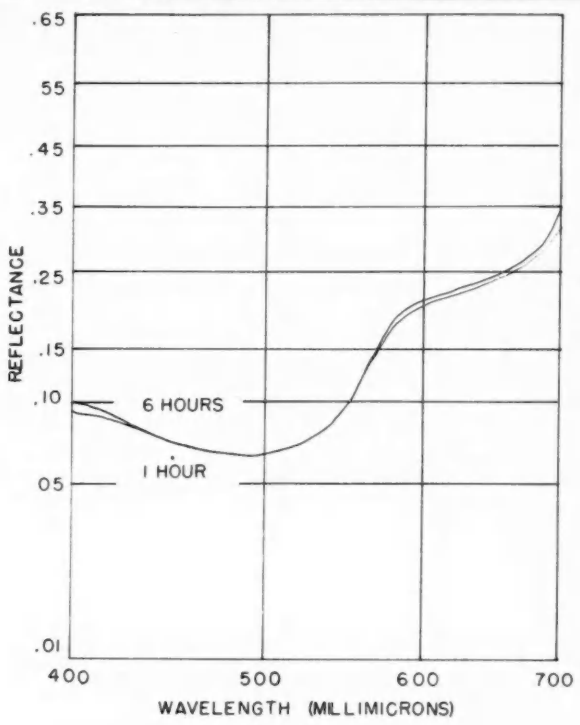


Figure 11
Combination dyeings on spun-rayon fabric

0.5% Calcodur Orange EGL
0.5% Calcodur Brown 4RL
0.5% Calcodur Resin Fast Grey 2G
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

tometric reflectance curves plotted in Figure 13 show that a six-hour dyeing made with 0.45% Calcodur Orange ERL and 0.3% Direct Fast Rubine CA is 106% stronger than the one-hour dyeing. It can be seen that the slopes of the curves of the one- and six-hour dyeings are quite similar. Based on these results, a six-hour dyeing requires only 38% as much dye as the one-hour dyeing. Therefore, unless a dyer is aware of this change, he would have considerable difficulty controlling a shade whose depth was increasing with each additional hour at the boil. It should also be noted that the dyeing boiled for six hours with the lesser amount of dye was superior in fastness to wet-crocking and water-bleeding when compared with the fastness of the one-hour dyeing.

Color Plate A, Figs 1, 2 and 3 show shades produced by selected dyes, one of which decomposes; dyes which are stable; and dyes which build up. Figs 4, 5 and 6 of Color Plate A show these same effects when one of the dyes in a combination decomposes; when all the dyes are stable; and when both dyes buildup.

FEEDING TECHNIQUES——Experiments have shown that the addition of direct dyes to a boiling dyebath for the purpose of shading to a given standard has a direct influence upon the shade and fastness obtained. If added in fairly substantial quantities, the last dye added will, in general, dominate the shade. The following dyeings, which were made on spun-viscose rayon fabric, will be described in detail to illustrate this effect:

20 Grams spun-viscose rayon fabric prepared for dyeing.
% Direct dyes
10.0% Common Salt
Liquor ratio 40:1

Dyeing A

0.5% Calcodur Resin Fast Yellow R
0.5% Calcodur Resin Fast Red 6B
0.5% Calcodur Resin Fast Blue 2G
Bring to the boil in 20 minutes and dye at the boil for 1 hour.

Dyeing B

0.5% Calcodur Resin Fast Yellow R
0.5% Calcodur Resin Fast Red 6B
Bring to the boil in 20 minutes, boil 30 minutes, and add
0.5% Calcodur Resin Fast Blue 2G
Boil 30 minutes longer.

Dyeing C

0.5% Calcodur Resin Fast Yellow R
0.5% Calcodur Resin Fast Blue 2G
Bring to the boil in 20 minutes, boil 30 minutes, and add
0.5% Calcodur Resin Fast Red 6B
Boil 30 minutes longer.

Dyeing D

0.5% Calcodur Resin Fast Blue 2G
0.5% Calcodur Resin Fast Red 6B
Bring to the boil in 20 minutes, boil 30 minutes, and add
0.5% Calcodur Resin Fast Yellow R
Boil 30 minutes longer.

As can be seen from the above data, these dyeings had exactly the same amount of each dye added to the dyebath and were boiled for 30 minutes with all the dyes present. However, none of the dyeings was similar to any other in shade. If red, yellow or blue dye was added last, the shade was redder, yellower or bluer, respectively, than the control in which all dyes were added at the beginning. The spectrophotometric reflectance curves in Figure 14 show these differences.

USE OF SUPPLEMENTARY CHEMICALS——A large number of chemicals common to the average dyehouse was evaluated to determine their effectiveness in alleviating difficulties caused by decomposition and

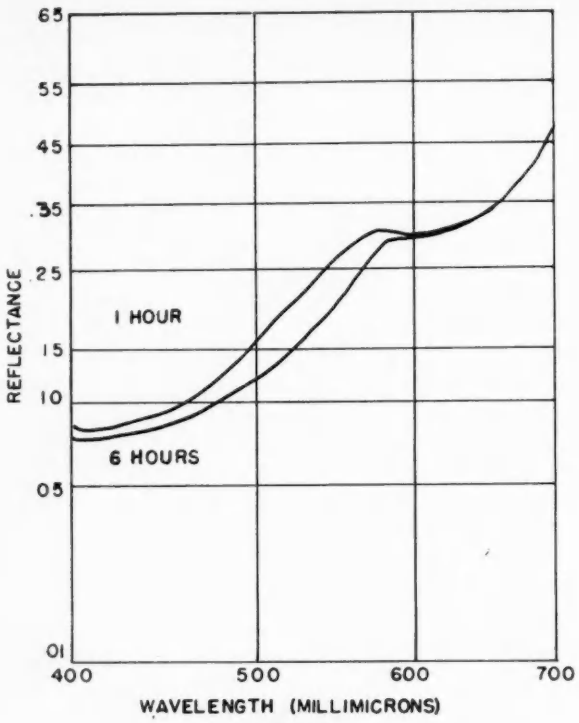


Figure 12
Combination dyeings on spun-rayon fabric

0.5% Calcodur Yellow NN
0.5% Calcodur Orange ERL
0.5% Calcodur Resin Fast Blue 2G
10.0% common salt
Liquor ratio, 40:1
Boiled one and six hours

These curves show that the blue did not change while the yellow and orange increased in strength.

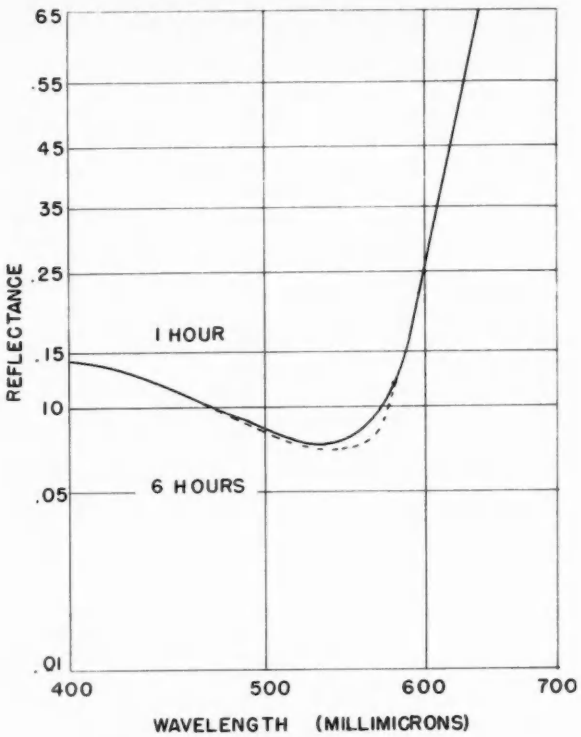


Figure 13
Combination dyeings on spun-rayon fabric

Dyeing boiled one hour		Dyeing boiled 6 hours	
1.0%	Calcodur Orange ERL	0.45%	Calcodur Orange ERL
1.0%	Calcomine Rubine CA	0.30%	Calcomine Rubine CA
10.0%	common salt	10.00%	common salt
	Liquor ratio, 40:1		Liquor ratio, 40:1

buildup. They were added to spun-rayon dyeings using 1% Calcodur Pink 2BL (an example of a dye which decomposes during dyeing) and 10% common salt. Several of these chemicals were found to be effective in preventing or retarding decomposition, and permitting greater color value to be obtained with the dyeings which were boiled six hours than was obtained with the control-dyeing which was boiled only one hour. Table V shows the results of reflectance measurements using the control-dyeing boiled one hour as 100%.

In a similar manner these supplementary chemicals were added to 1% dyeings of Direct Fast Rubine CA, an example of a dye which requires prolonged boiling for maximum color development. The results obtained, including pH of the dyebath at the beginning and end of the dyeing cycle, are shown in Table VI. It should be noted that ammonium chloride gave the greatest increase in color value; however, the shade was duller and bluer than that of the control. Ammonium thiocyanate increased the color intensity considerably, and was especially interesting because it also yielded a brighter shade than that of the control or any of the other dyeings.

These experiments show that with dyes which decompose and with those which build up, the addition of certain compounds, and especially those which are strong electrolytes, apparently acts to increase the rate of dye absorption. This results in more dye entering the fiber within a given time. With dyes which build up slowly, the increased rate of dye absorption brings the dyeing to its final equilibrium much sooner, thereby avoiding the prolonged progressive buildup

TABLE V

1.0% Calcodur Pink 2BL
10.0% common salt
5.0% of stabilizing chemical
Liquor ratio, 40:1
Spun-viscose rayon fabric

Color intensity in percent as determined by spectrophotometric reflectance measurements

Supplementary chemicals	*Boiled 1 hour*	*Boiled 6 hours*
Control—no additions	100	60
5% ammonium chloride	210	147
5% ammonium thiocyanate	170	132
5% ammonium sulfate, reagent grade	160	122
5% ammonium acetate	180	98
5% sodium chlorate	125	88
5% urea	115	80
5% cerelose	105	74
5% sodium nitrite	140	59

TABLE VI

1% Direct Fast Rubine CA
10% common salt
Liquor ratio, 40:1
Spun-rayon fabric
Boiled 1 hour

Supplementary chemical	*pH at Start*	*pH at End*	*Spectrophotometric reflectance measurements*
Control—no additions	6.5	6.8	100%
5% ammonium chloride	6.1	5.4	170%
5% ammonium sulfate, reagent grade	6.2	5.1	159%
5% ammonium thiocyanate	6.1	5.6	152%
5% sodium nitrite	6.7	7.5	128%
2% Marasperse CB[1]	7.1	7.2	116%
5% levulose	6.5	6.2	98%
5% cerelose	6.5	6.3	95%

[1] Marathon Corp Chemical Div

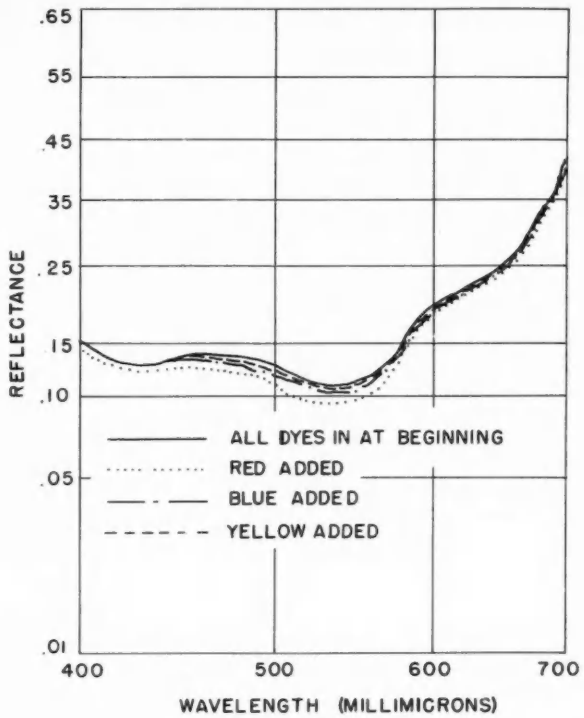


Figure 14
Combination dyeings on spun-rayon fabric feeding studies

0.5% Calcodur Resin Fast Yellow
0.5% Calcodur Resin Fast Red 6B
0.5% Calcodur Resin Fast Blue 2G
10.0% common salt
Liquor ratio, 40:1
Boiled one hour in all cases

which causes the dyer to have shade-control difficulties.

THE EFFECT OF AMMONIUM THIOCYANATE —— Since ammonium thiocyanate was found to be quite effective in preventing the decomposition of Calcodur Pink 2BL and in increasing the rate of color development with Direct Fast Rubine CA, dyeings were made on spun-viscose rayon fabric to determine its effect on all the dyes listed in Table IV. The effect on strength and shade was obtained spectrophotometrically and the differences are expressed in percent using the control dyeing made without ammonium thiocyanate as 100%.

It was found that the presence of ammonium thiocyanate in the dyebath destroyed or adversely affected three of the dyes. Most of the dyes, however, produced much deeper shades when dyeings were boiled for both one and six hours.

Combination shades, made with dyes which decompose and ammonium thiocyanate, generally produce deeper dyeings and truer shades after boiling several hours than the control which was boiled one hour without ammonium thiocyanate.

A combination shade using 0.45% Calcodur Orange ERL and 0.3% Direct Fast Rubine CA with 10% common salt was dyed on rayon and on cotton fabrics, both with and without 5% ammonium thiocyanate, and boiling one and six hours respectively. In these dyeings, the pieces dyed from baths containing the thiocyanate and boiled one hour were brighter, yellower and slightly heavier than the control dyeings which were boiled six hours without any thiocyanate being present.

These and many other combination dyeings not described in detail show that ammonium thiocyanate retards or inhibits decomposition, and also causes dyes which are normally slow in reaching their potential color-value development to attain, within one hour, a depth of shade approaching that obtained by boiling four to six hours without ammonium thiocyanate.

Figs 6, 7 and 8 of Color Plate B illustrate the beneficial effect obtained by the addition of ammonium thiocyanate to dyebaths containing respectively a dye which decomposes in the absence of ammonium thiocyanate, a dye which is stable, and a dye which builds up. It will be observed from Fig 6 of Color Plate B that the presence of ammonium thiocyanate prevents decomposition of the dye during a six-hour boil. Calcodur Resin Fast Grey 2G has been listed in Table IV as a stable dye when dyed by the procedure adopted for this investigation. Actually it increased in color value by 63% when 5% of ammonium thiocyanate was present in the dyebath. Calcomine Yellow 2G (*CI* 40000), a buildup dye, increased in color value about 100% when 5% of ammonium thiocyanate was present in the dyebath.

The reasons for the effectiveness of ammonium thiocyanate are not completely understood, but it was observed that the pH of the dyebath was lowered. (See Color Plate B, Figs 6, 7 and 8). The slightly acidic reaction of the thiocyanate neutralizes residual alkali which may remain in cotton or rayon materials. Steam may also entrain alkali from the boiler water and gradually raise the pH of the bath as the time of the dyeing cycle is lengthened. The presence of ammonium thiocyanate offsets this effect. It also prevents the decomposition of dyes by any alkali which they may contain. Dyeings made in the presence of ammonium thiocyanate produced more complete exhaustion of the dyebath than the control.

THE USE OF COMMON SALT ——During these studies it was found that common salt was quite effective in preventing or retarding decomposition when used in excess of the 10% amount added to all dyeings. Calcodur Resin Fast Yellow R and Calcodur Pink 2BL were used in these experiments because they were known to decompose to an appreciable extent. Five percent increments of common salt were added at the end of each hour to 1% dyeings made over periods of from one to six hours at the boil. The control, which was boiled one hour, had only the initial addition of 10%. The dyeing boiled two hours had 5% added at the end of the first hour making a total of 15%. The dyeings boiled three, four, five and six hours, had a total of 20%, 25%, 30% and 35% respectively.

Examination of the yellow dyeings showed that all of them were deeper in shade than the one-hour control

dyeing. All pink dyeings were heavier than the control; however, the strength increased stepwise through the two-, three-, and four-hour boil, which was the point of maximum color development. The five- and six-hour dyeings were somewhat weaker than the four-hour dyeing but were slightly stronger than the one-hour control dyeing.

Thus, laboratory dyeings with these two dyes indicate that decomposition can be retarded, or controlled, by careful additions of common salt. Periodic additions of even smaller increments may be equally effective and should be tried. Care must be exercised in the use of common salt since excessive quantities will cause precipitation and bronzing with dyes having moderate to poor solubility. This is especially true where low liquor ratios are used as in package, beam- and stock-dyeing equipment, or where dyeings are run at comparatively low temperatures. Common salt will not neutralize undesirable alkalis or lower the pH of the dyebath.

ACKNOWLEDGEMENT

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(13) Garrett and Peters, *J Textile Inst* **47**, 166 (1956).
(14) Armfield, *J Soc Dyers Col* **67**, 297 (1951).

Membership Applications

SENIOR

Robert L Amsler — Group leader, Research & Development Dept, The Chemstrand Corp, Decatur, Ala. Sponsors: M H Barnett, S J Davis. (S).

William M Baker—Textile colorist, E I duPont de Nemours & Co, Inc, Atlanta, Ga. Sponsors: L A Burroughs, A B Owens. (S).

Burnelle O Black—Dyer, shift supt, Ansonia Mills, Taunton, Mass. Sponsors: C F Getsinger, E G Maynard. (RI).

Francis Buresh — Textile research consultant, Chemstrand Corp, Decatur, Ala. Sponsors: A K Haynes, J C Cook. (S).

Harold J Ehrenberg—Textile chemist, E I duPont de Nemours & Co, Inc, Deepwater, NJ. Sponsors: C Black, C A Sylvester (DV).

Frank P Fields—Supervisor, dyeing, Mooresville Mills, Div of Burlington Industries, Mooresville, NC. Sponsors: A F Baker, W D Moss Jr. (P).

James E Hemphill—Textile chemist, Tennessee Eastman Corp, Kingsport, Tenn. Sponsors: S E Shepard, R J Fortune. (SC).

Milton B Horn — Development chemist, Catalin Corp of America, Fords, NJ. Sponsors: J M Ross Jr, J Austin. (Met).

Americo Morenzi—Lab technician, Cranston Print Works Co, Cranston, RI. Sponsors: R H Phillips, W H Angevine. (RI).

Melvin R Nipe—Textile chemist, Chemstrand Corp, Decatur, Ala. Sponsors: J E Farrington, E O Appeltofft. (S).

Piper M Osborne—Supt of dyeing, Reeves Bros, Eagle & Phenix Div, Columbus, Ga. Sponsors: L Tigler, H J Gambert. (S).

Marshall C Philpot—Dyeing & finishing, Hosiery Process Co, Chattanooga, Tenn. Sponsors: E Jurczak, G S McCarty. (S).

Nada D Poole—Household equipment specialist, Inst of Home Economics, U S Dept of Agriculture, Washington, DC. Sponsors: M S Furry, V I McLendon. (W).

Arthur E Raeubar—Head, Plastics Section, Southern Research Inst, Birmingham, Ala. Sponsors: F T Lense, J M Cook. (S).

Rosa K Taube—Household equipment specialist, Inst of Home Economics, U S Dept of Agriculture Research Ctr, Beltsville, Md. Sponsors: M S Furry, V I McLendon. (W).

Ajalon Tillery — Technical sales repr, Callaway Mills, Inc, New York, NY. Sponsors: J F Hagen, E W K Schwarz. (Met).

Jack Wilkinson—Chemist in charge of bleaching, Sayles Finishing Plants, Saylesville, RI. Sponsors: G O Linberg, W N Parsons. (RI).

ASSOCIATE

Galileo Boschetti — Master dyer, Fabrica de Tejidos, Managua, Nicaragua.

Yuzuru Ohmura — Staff member, Nichmen Co, Inc, New York, NY. (Met).

Jayantkumar Parikh — Secretary, Silk & Art Mills' Research Assoc, Bombay, India.

John P Schwede—John P Schwede Co, Caracas, Venezuela.

JUNIOR

Alexander V Finn—Chemist, Sandoz, Inc, New York, NY. Sponsor: A W Spencer, C W Saalfrank. (Met).

STUDENT

Carleandrea de Marchi — Student, Universita di Modena, Modena, Italy. Sponsor: W D Milla.

Felix H Dover and **Bejon Sehtna**—Students, North Carolina State College, Raleigh, NC. Sponsor: A H Rutherford. (NC).

Frank Geraci and **John Grange**—Students, Philadelphia Textile Institute, Philadelphia, Pa. Sponsor: W H Hughes. (PTI).

George Sharpton—Student, Clemson College, Clemson, SC. Sponsor: J Lindsay Jr. (C).

Anthony P Vellucci — Student, Rhode Island School of Design, Providence, RI. Sponsor: H B Sturtevant. (RISD).

TRANSFER TO SENIOR APPLICANTS

Robert L Boynes—Lab tech & color matcher, Geigy Chemical Corp, Newton Upper Falls, Mass. Sponsors: W E Durgin, H J Mack. (NNE).

Edwin Jurczak—Salesman, Burkart-Schier Chemical Co, Chattanooga, Tenn. Sponsors: G S McCarty, D H Gunther. (P).

No Su Kim—Instructor, Engineering College, Seoul National Univ, Seoul, Korea. Sponsors: R E Morrison, F Kobayashi.

REPORT OF 194TH MEETING
Technical Committee on Research

THE 194th meeting of the Technical Committee on Research convened in the Washington Room of the Hotel Statler, New York, NY, on Thursday, January 23, 1958, with Chairman Charles A Sylvester presiding.

The following members were present: M J Babey, *vice chairman;* H W Stiegler, *director of research;* C W Dorn, *chairman, Executive Committee on Research;* W D Appel, R F Aurich, J R Bonnar, T F Cooke, P J Fynn, A H Gaede, H B Goldstein, M W Goodell, H E Hager, E C Hansen, A E Hirst, A I Hultberg, A E Johnson, A J Kellner, J Labarthe, J E Meili, H E Millson, J E Norton, B R Norwick, G P Paine, B A Ryberg, V S Salvin, C H A Schmitt, G H Smith, R B Smith, R H Souther, J G Stass, J M Straley, F H Steiger, R L Stutz, P Theel, L S Thompson, M W Winkler, G W Wernz, P J Wood, and C L Zimmerman.

Mr Sylvester called on Mr Paine, executive secretary of the Association, to discuss the Procedural Guide and also the Convention to be held in Chicago next Fall.

Mr Paine stated that copies of the manuscript for the Procedural Guide, which is intended to clarify the complicated procedures of an organization as large as the AATCC, had been sent to all members of TCR and other committees for comments, criticisms and suggestions. Several drafts may be necessary to incorporate suggestions. He proposed to add material explaining the relationship of the Association to ASA, ISO, ASTM and other relationships of interest to members of AATCC. In addition to the functioning of research committees, there will be added, eventually, material governing Council committees.

With respect to the Chicago Convention, Mr Paine advised that Elliott Morrill, vice president, Western Region, is chairman of the Convention. The Convention Theme, "Assuring Advancement Through Cooperating Committees," is based on the fact that there are 66 committees working under the Technical Committee on Research. Manned by more than 400 volunteer working members and AATCC research associates and supported by the National Headquarters staff and laboratories, these committees implement the objectives of the Association and assure advancement in acquiring and disseminating knowledge of our scientific and technical endeavors.

There will be no commercial exhibits at Chicago; however, research exhibits will be sponsored by the various AATCC Research Committees. The Saturday morning session will be devoted to "What's New in AATCC Research."

Mr Sylvester called on Mr Dorn, chairman of ECR, who stated that ways and means for financing these exhibits would be discussed at the ECR meeting that afternoon. Also scheduled for discussion was the possibility of organizing a Committee on Mercerization and one on the Compilation of Data on Textile Complaints. This latter Committee is to collate information useful to industry in spotting the development of trouble by the number of complaints and failures of textiles and apparel received at regular intervals from authoritative sources.

Mr Sylvester read his annual report as prepared for publication in the *Year Book*. A motion was made, seconded and passed to accept the chairman's report and approve its publication in the *Year Book*.

REPORT OF THE DIRECTOR OF RESEARCH——Dr Stiegler reported as follows:

"The new Committee on Evaluation of Staining and Soiling, under the chairmanship of H B Goldstein, held its first meeting yesterday with an excellent roster of very capable and authoritative investigators. This field is rather complicated with regard to the nature of soiling and staining materials and the resistance of textile materials and finishes to them. A great deal of scientific effort will be required and the Committee is indeed well prepared to provide it.

"A few items of general interest may be mentioned as a result of visitors to the AATCC Laboratories.

"Considerable interest exists in the utilization of metal hydrides. These unique compounds were regarded as curiosities for some time but certain of them are becoming available in larger quantities. Sodium borohydride, for instance, has good reducing properties in alkaline solutions and has specific action in reducing carbonyl groups to hydroxyl and can reduce aldehyde groups in hydrocellulose. There may be applications of interest in the textile field where the properties of these compounds may be utilized.

"A visitor from Japan came in specifically to inform us enthusiastically about the applications of the Accelerotor, particularly in the evaluation of finishes for wash-and-wear fabrics in Japan. An Accelerotor test was developed, used and recommended to customers of a chemical concern manufacturing finishes for crease resistance. The Accelerotor was recommended after trying numerous machines and equipment, for running the wash phase of the evaluation of finishes. Specimens of a given finish are washed in the Accelerotor for time intervals of 30 seconds, 5, 10, 20 minutes. They are then evaluated for durability of crease resistance. Also built by the company was a device for evaluating crease resistance of fabrics. One of these instruments has been shipped free to AATCC as a gift. When received, full details will be supplied to our Committee on Crease Resistance.

"The Accelerotor and accessories are now practically standardized, with the exception of the addition of 2 short rotors (4¼ inch-straight and S-shaped) to the present 4½- and 4¾-inch rotors. This will permit better testing of heavy or bulky fabrics and will provide a very useful range of rotors.

"In addition to inter-laboratory tests on dry abrasion and reproducibility in the Accelerotor and an inter-laboratory test on abrasion in industrial laundering of work clothes fabrics, investigations are now underway—at the request of the committees—on the development of a dry abrasion edge-wear test and the application of the Accelerotor to testing color loss due to abrasion in the laundering of synthetic fiber fabrics, along the lines used in the industrial laundering tests on cotton work-clothes fabrics.

"Other projects at Lowell are on chlorine retention and dimensional changes (restorability). The expected delivery of a tension presser for the latter project will permit resumption of work started some time ago on the restorability problem.

"The chairmen of committees sponsoring work at Lowell will report in detail on their projects."

COMMITTEE ON SOILING AND STAINING———Chairman Goldstein reported on the first meeting of the Committee, which will ultimately concern itself with all aspects of soiling, such as dry soiling, soiling with water-borne stains and soiling with non-aqueous liquid stains. This latter has not had much attention and, therefore, was chosen for the initial problem of the Committee. A literature search will be made and information will be gathered from cleaning and laundering organizations and the Committee on Soiling of Carpets covering the types of soil normally encountered and which are most troublesome to the consumer. Specific lines of attack will then be formulated.

COMMITTEE ON ATMOSPHERIC CONTAMINANTS———Dr Salvin reported on a repeat trial of the effect of air-contaminants on disperse-dyed acetate fabrics to show the effects of oxides of nitrogen and of ozone. Eight months of testing showed the AATCC test ribbon, designed to show about 6 to 8 months' fading, is actually showing that amount of fading in many areas across the country. Very interesting results are expected at the end of 12 months. A tentative test procedure for ozone fading, including a standard test fabric, is being developed. Information of interest with reference to end-use performance is anticipated.

Efforts are being made to reduce the time required for a standard gas-fading test. Various types of metallic screens were investigated in attempts to increase the amount of oxides of nitrogen in the combustion chamber flame, but results were negative.

Recently introduced fiber-reactive dyes tested in England were rated as not fast to atmospheric fading, but further investigation indicated that in England the generated oxides of nitrogen were used. When these dyes were tested in the AATCC gas-fading chamber, the Committee found they were not poor to gas fading on cotton, and a service test of eight months confirmed this.

The Committee is engaged in a joint effort with the Lightfastness Committee in examining the effect, on cotton, nylon, rayon, and wool fabrics, of materials which might influence lightfastness. Certain dyes which have been used as standards for lightfastness, notably on cotton, change rather badly on gas fading.

COMMITTEE ON ANALYTICAL METHODS———Mr Wood stated that the Committee had been working on residual alkali in the bleaching of cotton fabrics and that most of the work had been completed. He suggested that it might be well to have the AATCC Laboratories check any test method which might be evolved from this work. Mr Sylvester approved the suggestion.

COMMITTEE ON COLORFASTNESS TO PLEATING———Dr Meili reported that laboratory tests had been run and mills had been contacted for methods in actual use. Good correlation had been obtained. Three pressures were chosen for a proposed test method (requiring 20 minutes), namely, zero steam pressure, 10 lbs and 20 lbs. The International Geometric Gray Scale was unanimously chosen for evaluation. The proposed tentative test method was expected to be sent out for mail ballot shortly.

COMMITTEE ON RESISTANCE TO ABRASION———Dr Cooke reviewed the progress made with the AATCC Accelerotor. The need for service-wear information was emphasized. Members of TCR were asked for samples of fabrics, *which have known, end-use wear-tested characteristics,* to be sent to the AATCC Laboratories for testing in the Accelerotor to check correlation between the instrument and actual wear. He stated that there was every indication of correlation, not only in the inter-laboratory tests which had been run on a series of fabrics, among which were field-tested fabrics, but on other work done at Lowell during the development of the Accelerotor.

The Committee is planning to draft a test method and would like to get all available data on actual wear of fabrics.

Dr Cooke summarized the important inter-laboratory tests which firmly established reproducibility of results in the Accelerotor as follows:—

"An inter-laboratory study was carried out comparing seven machines with the above improvements. This study which was set up on a statistical basis included tests of four sheetings, considerable data on which had been obtained by the Textile Research Institute. These fabrics were as follows: 1) unfinished, 2) mercerized, 3) resin-treated, 4) mercerized and resin-treated. In addition, comparisons were made of three twill work fabrics on which the DuPont Company is obtaining considerable wear-test data. Additional comparisons were made on untreated and resin-treated rayon samples supplied by the American Viscose Company.

"This statistically designed study was carried out in order to determine how reproducible the various Accelerotors were with the latest improvements and to determine the effect of liner wear on test results. In addition, since service wear data are available on some of the fabrics tested, the analysis of the results should give an indication of whether the Accelerotor test correlates with service wear.

"The study of the Accelerotor was carried out at the Better Fabrics Testing Laboratory in New York with the help of Dr Stiegler and his Lowell staff. The results of the test were analyzed statistically and it was found that there was little variation in results between the seven Accelerotors used. There was evidence of little, if any, wear on the abrasive liner throughout the length of the test. The tests were carried out by two methods . . . one in which the speed of the motor was controlled and one in which it was not controlled. Both the controlled and uncontrolled methods of test gave excellent reproducibility. With the twill fabrics, the uncontrolled speed gave better precision, but with the cotton sheetings and rayon, the controlled speed method gave slightly better precision than the uncontrolled method.

"Not only did the results of the test indicate good reproducibility between the various Accelerotors, but there was evidence of a correlation between the abrasion test and the wear service data. In the case of the cotton twill fabrics, the abrasion resistance correlated with the wear service data obtained to date by the DuPont Company in trouser wear tests. The cotton sheeting fabric showed that the resin-treated fabrics had less resistance to abrasion than the untreated fabrics. The mercerized and resin-treated fabric had slightly more resistance to abrasion than the resin-treated, unmercerized fabric. In the case of the viscose-rayon fabrics, the resin-treated fabric showed considerably less resistance to abrasion than the untreated fabric."

It is planned that an article on the above inter-laboratory abrasion study will be submitted to the *American Dyestuff Reporter* for publication.

The Committee is desirous of developing a test on edge-wear as well as tests carried out by the weight-loss method.

COMMITTEE ON ANTIBACTERIAL AGENTS———Mr Sylvester commented that this Committee would shortly have a tentative test

method for the antibacterial properties of fabrics.

COMMITTEE ON ANTISTATIC FINISHES —— Chairman Steiger reported that the Committee had carefully edited its proposed tentative test method as a result of a review which had considered comments and suggestions. Based on changes made, the Committee will vote on the final draft at the next meeting. The scope of the test method is to determine the electrostatic properties of a fabric by measuring surface electrical resistivity. Electrical resistivity influences the accumulation of electrostatic charge on a fabric.

COMMITTEE ON CARPET SOILING———Under the chairmanship of Dr Cooke, the Committee undertook to compare the methods of both floor-service tests and accelerated tests for soiling of carpets being used presently by eight cooperating laboratories. The carpets for the test were woven from cotton, wool, acetate, Saran, nylon, rayon bright crimp, rayon dull crimp, and rayon dull smooth. Seven laboratories are conducting floor-service tests and four are conducting accelerated soil tests—each lab using its own test method. Preliminary progress reports indicated fairly good agreement but final results did not indicate as good correlation. When similar methods of measuring soiling are used, it is believed that there will be better correlation. Considerable work is planned with respect to soiling, evaluation by jury (visual) and reflectance values.

COMMITTEE ON COLORFASTNESS TO CROCKING———Chairman Millson reported as follows:—

"The dry crock test is reproducible. The moisture content of the colored fabric influences the results and therefore samples should contain a normal amount of hygroscopic moisture when tested. Tests should not be run on bone-dry samples.

"Variations occur with the wet crock test. Some factors which influence the results are variations in moisture content, performance of the Crockmeter and the operator.

"Quantitative tests have shown that the crock fabric must contain a minimum of 50% moisture for good reproducibility.

"A new method for moistening the crock fabric is under investigation. In this method the crock fabric is wet by applying the water in drops from an eye dropper.

"Some plant men consider the present crock test too severe while other plant men believe it to be too lenient. The Committee believes both views are correct depending upon the material and the end-use requirements. One way to solve this problem may be to have Crock Tests #1, #2 and #3. Five cycles would be run for Crock Test #1, ten cycles for Crock Test #2 and twenty cycles for Crock Test #3. This idea is under investigation.

"A number of ideas for improving the Crockmeter are to be submitted to several engineers for study. A Crockmeter incorporating their suggested improvements will then be built and evaluated against an unused present model AATCC Crockmeter."

COMMITTEE ON END-USE——— Chairman Labarthe reported on a proposal (referred to his Committee by ECR) to collect data on the failure of textiles in consumer service as follows:—

"This topic was a proposal for the AATCC to officially sponsor a system of collecting data on the performance, at consumer level, of textile products. Such data, it was believed, could be of considerable value to the industry. If we could supply producers with a classification of the difficulties customers actually have with merchandise the industry could remedy the difficulty in either or both of two ways:

1) If the merchandise is basically faulty, fix it.
2) If the customers are misusing the merchandise, educate them by advertising, by informative labeling and better exchange of information at point of sale.

"Because the National Institute of Drycleaning had already systematized the gathering of data on service failure of textile merchandise handled by them, and because Albert E Johnson was connected with the proposal from its inception, he was asked to explain the system.

"After some discussion following Mr Johnson's explanation of the data-collecting system, a motion was made and carried that the End Use Committee report favorably on this method of data collection and to recommend that AATCC actively foster the collection of such data and its final tabulation at Lowell as a service to its members.

"Immediate action by this Committee would be to revise the data forms and send to various laboratories where such data is available a copy of the revised forms along with a statement of purpose and an invitation to participate.

"Laboratories of six Committee members would take part and the following were suggested as possibilities: Macy's, Gimbel's, Montgomery-Ward, University of Texas, University of California, Ohio State University, Pennsylvania State University and other universities doing this kind of work.

"It was suggested that participating laboratories make quarterly reports to Lowell."

A motion was made, seconded and passed that AATCC collect data on consumer complaints, put it in tabular form and make it available to AATCC members.

A motion was made, seconded and passed that the committees of TCR be requested to examine their test methods to determine whether or not they are applicable to the testing of *industrial* fabrics.

COMMITTEE ON COLORFASTNESS TO LIGHT———Mr Norton discussed the reorganization of his Committee to include the effect of weathering on colorfastness. The physical effects of weathering on textile material remains within the scope of the Committee on Weathering of Textiles. The Committee on Colorfastness to Light therefore is being divided into separate task groups. Four such groups are:

1) Study of variables encountered in daylight and sunlight fading under glass. This group has been operating for some time under the chairmanship of Mr Schmitt.

2) The combined effect of light and atmospheric gases. Completely diffeent effects are being obtained when this combination of light and gas fading which would include ozone or oxides of nitrogen fading. This group is headed by Dr Salvin.

3) Since the present carbon-arc test is comparatively dry (it correlates fairly well with the sunlight under glass test—9 am to 3 pm), the Atlas Electric Devices Co Laboratory is working on the effect of moisture. The present daylight test (24 hours a day) permits absorption of moisture at night and therefore gets the combined effect of radiation and moisture.

4) Colorfastness to weathering. This group is expected to recommend a method for conducting outdoor weathering exposures; then to develop laboratory methods to correlate with the outdoor exposures.

COMMITTEE ON NONWOVEN FABRICS———In the absence of Chairman Taylor, a member read his report. Among other items, this Committee is interested in the effect of

abrasion on nonwoven fabrics and has submitted a series of fabrics to the AATCC Laboratories for demonstration of the Accelerotor as a test instrument for abrasion effects. Work done about four years ago indicated promising applications.

COMMITTEE ON DAMAGE CAUSED BY RETAINED CHLORINE———Chairman Aurich, reported that the Committee had adopted a specific program. The basic features of this program are two-fold: 1) the establishment of six task forces or subcommittees to simultaneously explore various facets of the problem, and 2) the establishment at Lowell of a research project to investigate certain aspects of the problem, particularly with respect to the precision of the revised test procedure. To carry out both features of the above program, authorization and approval was secured from the Executive Committee on Research to purchase and finish certain anticipated fabric needs. Authorization was also secured from the Executive Committee on Research for the establishment of the project at Lowell.

Under the first feature of the program, the specific assignments of the six subcommittees are as follows:

1) To determine the choice of resin, catalyst, and/or other additives to be used as the standard finish or finishes by other committees in their experimental work. Also, to study the behavior of various types of resin finishes using the revised test procedure.

2) To study the effect of variations in the prewetting and chlorination steps of the procedure.

3) To study all facets of the rinsing operation, scorching procedure, and the effect of varying conditioning times of the revised test procedure.

4) To determine the performance in commercial and domestic launderings of the standard fabrics and finishes to be used and the correlation of same with the revised test procedure results as obtained by those committees experimenting with standard finishes and fabrics.

5) To determine the behavior of colored yarns and nonresin finishes, including chlorine-sensitive dyestuffs and various textile auxiliaries, eg, certain cationic softeners.

6) The Steering Committee will pass on test-method revisions and publications, coordinate the work of the various subcommittees, and direct the research project at Lowell and act as liaison between it and various subcommittees.

The subcommittees have all met and outlined a program of action within the scope of the particular subcommittee's activities as set forth in the assignments tabulated above. The programs adopted were submitted to the review of the Steering Committee and have now been approved for action. Three thousand yards of fabric were purchased, of which 2,143 yards were put into the bleach state, from which 1,300 yards had been put into a standard resin formulation as ultimately worked out by the Formulations Subcommittee after an extensive amount of laboratory and pilot-plant experimentation. The goal of the Formulations Subcommittee, as previously agreed upon by the main committee, was to prepare a standard finish which would show a medium degree of damage, because it is in this range that most of the trouble in correlation is experienced.

The Steering Subcommittee met early in March with personnel at Lowell to establish the project authorized by the Executive Committee on Research.

Investigation in accordance with the outlined program is underway at Lowell. After a certain amount of preliminary experimentation, they have made specific proposals for a system of equipment to be used in the standard chlorination procedure. Again, as with the subcommittees, with the availability of the standard finish fabric, a great acceleration of the project is to be anticipated.

COMMITTEE ON COLORFASTNESS TO WASHING———Chairman R B Smith discussed the work that had been carried out at Lowell to modify the #3A Wash procedure in order to produce the color loss equivalent to five industrial launderings. Increased temperature, alkalinity, number of steel balls and running time did not produce sufficient color removal to duplicate the results of industrial laundering. Although no practical laboratory test was developed, it was found that the color loss could be duplicated by running a test for 3¾ hours in the Launder-Ometer, using metal cylinders and the combination of steel balls and sand at 160°F.

Previous work at Lowell had indicated that the relatively high rate of color removal shown by industrial laundering was due primarily to abrasion and could be duplicated by a three-minute test in the Accelerotor. On the basis of this work, a tentative test procedure was written and an interlaboratory survey was run on the 12 samples of work clothing fabrics that had previously been subjected to industrial laundering tests. The samples were submitted to six laboratories. All of the samples exhibited similar color loss and, on the basis of the Gray-Scale evaluations, exhibited good correlation with the fabrics subjected to five industrial launderings.

It was voted that the purpose and scope of the tentative test method specify that the procedure is applicable only to fabrics that possess good fastness to the #3A Wash Test.

It was voted that the Committee recommend to TCR that the Accelerotor method for determining fastness to industrial laundering be adopted as a tentative test method.

The Committee felt that the effect of small variations in rpm and running time should be investigated, but that this should not hold up submission of the method to TCR. Mr Mandikos will carry out the requested work at Lowell.

A definite need still exists for a standard mechanical test method to duplicate hand washing. The Committee has been unsuccessful to date in obtaining fabrics that fail a #2A Wash Test but are satisfactory to hand washing. It is hoped that anyone having access to such fabrics will forward at least 10 yards (preferably 20 yards) to the secretary so that an interlaboratory survey can be made and used as the basis for developing a mechanical laboratory test procedure.

COMMITTEE ON WEATHERING OF TEXTILES———Chairman Rizzo reported as follows:

"A decision had been made by TCR and approved by ECR that the scope of the Committee's activity would henceforth encompass only the degradation aspects of weathering with the fading aspects being transferred to the Lightfastness Committee.

"In light of this decision, the Committee re-evaluated several possible approaches to the calibration of weathering equipment and has decided to investigate not only the NBS blue papers and the AATCC Blue Lightfastness Standard but also laminated and other materials for this purpose.

"The Committee agreed to proceed immediately to explore in accelerated equipment the fabrics produced for the Committee at the Philadelphia Textile Institute with the funds approved by TCR and ECR. Calibration of total energy input will be on the Blue Papers and the AATCC Blue

Lightfastness Standard.

"The Committee agreed to proceed with weather exposures of the three "lab" fabrics and commercial fabrics to be solicited from the trade using sites available at no cost to the Association. These sites must be those instrumented to measure the energy input as well as other pertinent weather factors.

"The Committee requires a determination by TCR as to whether coated fabrics and certain functionally finished fabrics come within the scope of the Committee's activity. This decision can influence the future course of action."

COMMITTEE ON CONTINUOUS WOOL SCOURING PROCESSES ——Chairman Hansen discussed a problem that has bothered the wool industry for some time. The difficulty was the turning to the red side, after a short time, of pastel shades dyed on wool with fast colors. The Committee had investigated the problem and after several years work concluded that the cause of this red fade was chlorophyll that is picked up by the fiber (through rubbing in pasturage or otherwise) and is not removed in normal scouring procedures. There is a possibility also that bile acids are a contributing factor, but this has not been determined positively.

A detailed paper on the subject has been published in the February 24th issue of *American Dyestuff Reporter*. Because the problem is still troublesome in industry, the work of the Committee is expected to be of considerable value.

COMMITTEE ON TEST FABRICS ——Chairman Wernz discussed possible changes in the six-fiber test cloth. The supply of Orlon 81 filament yarn presently used as the nonstaining warp yarn will no longer be available from the producer. The only suitable replacement, which will not seriously affect the features of the test cloth, is Dacron, Type 56 semidull. The Committee opinion, after preliminary studies, was that the change could be made. A suggestion was offered that, at the same time, the spun nylon filling stripe be replaced with a filament nylon, Type 200 semidull because of the shift in industry to this filament type from the spun type. It was also suggested that the spun silk fiber be replaced at this same time with either a polyester or acrylic fiber.

The Committee will poll TCR for opinions on these changes.

HIGH-TEMPERATURE DYEING PROJECT——This AATCC project, being carried out at the Philadelphia Textile Institute with funds donated by the Delaware Valley Section, was discussed by Professor Theel. All of the experimental work on cotton, wool and rayon had been completed. Pure water was used in all tests. For wool, the dye assistants were Glaubers salt, sulfuric acid, acetic acid, and formic acid; for cotton and rayon, common salt, caustic soda, sodium hydrosulfite and Glaubers salt.

Individual assistants were run in water in percentages normally used in the presence of dyes. Wool was then run in the presence of Glaubers salt and the various acids to note the effect of the combination. The dyes used were acid, neutral acid, direct metallized acid, direct and chrome colors. In each case tests were run at 200°, 225° and 250°F at times of 15, 30, 45 and 60 minutes.

For cotton and rayon, direct and vat dyes were studied: the dyes were tested individually and with each of the assistants normally used with them, as well as the complete make-up for the bath.

In each case, a 100-gram sample of fiber was used. pH was taken at the beginning and end of each experiment. The samples were examined for color and tensile strength by fiber bundle. In the case of wool, alkali solubility was determined as well and in the case of cotton and rayon, fluidity tests were made.

At the present time, studies on Dacron, Orlon and Acrilan are being studied.

TEST METHODS FOR SUBMISSION TO BALLOT AS TENTATIVE STANDARDS —— Mr Sylvester asked for approval of the following four methods for submission to letter ballot vote of TCR:

1) Colorfastness of Textiles to Industrial Laundering
2) Antibacterial
3) Colorfastness to Pleating
4) Resistance to Wetting (Alternative Dynamic Immersion Absorption Test).

A motion was made, seconded and carried to do so.

Before closing the meeting, Mr Sylvester stated that the year 1958 started with a January Quarterly Meeting which listed about 20 TCR Committees scheduled for meetings. This number and the number of reports presented and members attending probably ranked among the largest ever to date. This also seemed to support the three-day meeting schedule in spite of inconvenience to some persons. He invited comments or letters to him on this subject.

Respectfully submitted,
H W Stiegler

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

58-6

Education: BS, textile chemistry, New Bedford Institute of Technology, 1950; AATCC Textile Chemistry Award in 1949; Phi Psi Award in scholarship in 1950.

Experience: Dyer; dyer-chemist; plant chemist — dyeing, printing, and finishing natural and synthetic fibers. Resume on request.

Age: 32; married; references.

Position desired: textile chemist; textile sales and service.

Location desired: Northeast; Continental USA acceptable.

3-24; 4-7

58-7

Education: Engineering College of Baghdad, Baghdad, Iraq, 1 year, sciences; Royal College of Pharmacy & Chemistry, Baghdad, Iraq, 4 years, BS, chemistry; New Bedford Institute of Technology, 2½ years, MS, textile chemistry.

Experience: 3 years petroleum chemist, private enterprise and government.

Age: 27; single; no dependents; references.

Position Desired: chemist in textiles and/or related fields; petroleum chemist.

Location Desired: open in USA or Middle East.

Present Occupation: Student.

4-7, 4-21

Test for Dimensional Changes in Woven Fabrics in High-Temperature Dyeing—

(concluded from page P220)

5) Procedure (60-min duration)

5.1 WASHING AND RINSING———Place the specimen or specimens in the machine with sufficient similar fabric to make up the proper dry load. (See Item 3.4 under "Materials and Apparatus"). Start the machine, noting the time. It is to be kept running continuously for 60 minutes during which time the following operations are to be carried out as indicated, each without delay.

5.1.1 Run water to the proper level for washing. (See Item 3.4 under "Materials and Apparatus").

5.1.2 Add approximately 0.26 ounces per gallon (2 grams per liter) of sodium carbonate. Rapidly raise the temperature to 95°C (203°F). Add sufficient soap to give a good running suds. If more than 0.66 ounces per gallon (5 grams per liter) of soap is used, the amount and reasons for use is reported. The temperature should be maintained at not less than 80°C (176°F).

5.1.3 When the machine has run for 40 minutes from the start of the test, drain off the soap solution quickly and fill the machine with water to the proper level for rinsing and raise the temperature to 60°C (140°F).

5.1.4 When the machine has run for 45 minutes from the start of the test, drain off the water, fill, and heat to 60°C (140°F) as before.

5.1.5 At the end of 55 minutes from the start of the test, drain the water off quickly and allow the machine to run without further additions to complete the full 60 minutes of operation. Shut off the machine.

5.2 EXTRACTION———Remove the specimens from the apparatus. Remove excess water. (See 3.5).

5.3 PRESSING———Press each specimen, being careful to see that it is smoothed without stretching to remove wrinkles before pressing. When the hand iron is used, press down with it in a manner simulating the action of the flat-bed press, using a pressure which, when combined with the weight of the iron, will produce a pressure of 6.8 to 9.1 ounces per square inch (30 to 40 grams per square centimeter) on the fabric; do not slide the iron back and forth. This operation is continued until the moisture in the fabric is low enough to facilitate conditioning from the low side.

5.4 EVALUATION———Allow the pressed specimen to cool, condition it in the standard atmosphere[5] as before. Lay it out without tension on a flat smooth surface, being careful to see that it is free from wrinkles and creases. Measure the previously measured distance marked on the specimen. Calculate the average change in dimensions in the warp and filling directions separately.

[5] For ISO/TC 38 purposes, the standard atmosphere in which physical tests on textile materials are performed has a relative humidity of 65 ± 2 percent and a temperature of 20° C± 2° C (68° F ± 4° F). In tropical and subtropical countries the supplementary atmosphere for testing has a relative humidity of 65 ± 2 percent and a temperature of 27° C ± 2° C (81° F ± 4° F).

6) Report

6.1 Report the average values in the warp direction and filling direction separately, as a percentage of the dimension before laundering, but not beyond the first decimal place, as the shrinkage, or stretch if appropriate, of the specimen in the test.

OLNEY MEDAL AWARD CANDIDATES

THE Olney Medal Award Committee invites Senior members of AATCC to nominate candidates for the 1958 Olney Medal.

The medal is awarded for outstanding achievement in the field of textile chemistry, including the development of chemical agents or chemical processes used in the manufacture of textiles, or methods of their evaluation. Its purposes are to encourage and afford public recognition to such achievements and contributions and to be a testimonial to Dr Louis Atwell Olney in recognition of his life-time of devotion and multitudinous contributions to this field.

Nominations should set forth in detail all facts which qualify the candidate of consideration, with particular reference to published works and professional qualifications.

Previous winners of the Olney Medal are: Milton Harris, William H Cady, Edward R Schwarz, Harold M Chase, Charles A Seibert, George L Royer, Raymond W Jacoby, Werner von Bergen, Roland E Derby, William D Appel, Miles A Dahlen, Walter J Hamburger and P J Wood.

The voting members of the committee on awards are: Percival Theel, *Chairman;* Paul L Meunier, Edward W Lawrence, Milton Harris, President Geo O Linberg, ex-officio.

Nominating letters and complete data should be in the hands of the committee by April 15th. Please address to G P Paine, secretary, Olney Medal Committee, AATCC, Box 28, Lowell, Mass.

PAPERS FOR 1958 CONVENTION

INDIVIDUALS and firms desiring to present papers at the AATCC Convention in Chicago, Oct 30-Nov 1, 1958 should send 100-200 word summaries to:

Leonard J Armstrong

Varney Chemical Corp

Janesville, Wisconsin

before May 15, 1958.

Papers should be of interest to a large segment of the textile industry. Oral presentation should be streamlined to a 20-minute delivery time.

ACTIVITIES OF THE LOCAL SECTIONS

Southeastern

THE first meeting for 1958 of the Southeastern Section, was held at the General Forrest Hotel, Rome, Ga, on March 1. Arrangements for the meeting were handled by Sectional Committeeman Frank H Cooper of Dixie Belle Mills, Inc. Attendance was slightly over 100 including several wives and guests of members.

An unusual feature of the meeting was a morning tour of the Rome Kraft Co, where members observed the extraction and purification of cellulose from logs to the finished product. The technical session included a discussion of Kraft pulp production by McDewain Sandlin, chief chemist, Rome Kraft Company. Mr Sandlin's discussion afforded members the opportunity to compare cellulosic technology as applied in the textile industry to that of Kraft pulping.

Talks were presented at the technical session by Raymond Thornton, technical service manager, Arnold, Hoffman & Co, Inc, Providence, RI, and Richard Howarth, also of Arnold Hoffman. They spoke on the properties and practical application of Procion dyes.

Chairman William B Griffin presided at the meeting, during which the following committee chairmen were appointed: Frederick T Lense, *Intersectional Contest Paper;* George L Dozier, *Corporate Membership;* A Kempton Haynes, *Student Chapters;* and John C Cook, *Membership.*

Rhode Island

THE meeting scheduled for March 21, by the Rhode Island Section has been rescheduled for Friday, May 16, at the Providence Engineering Society, Providence, R I, at 8 pm with an informal dinner at 6 pm at Johnson's Hummocks.

The program will be a paper, "Continuous Procedures for Dyeing Synthetics and Blends," by Joseph J Iannarone, E I duPont de Nemours and Co, Inc and a film, "Color Magic" sponsored by Interchemical Corp with commentary by Everett Counsell.

Washington

THE Washington Section will hold its final meeting of the 1957-8 season on Friday, April 11, at the National Housing Ctr, 1625 L St, NW, Washington, DC.

Fred Fortess, manager of the Dye and Finishing Laboratories, Celanese Corp of America, Charlotte, NC, will discuss "New Developments in Chemical Finishing of Textiles."

Delaware Valley

"A Night in Las Vegas" will be the theme of the Delaware Valley Section's 1958 Ladies Night Meeting, to be held Saturday, April 12, in the International Room, Kugler's Restaurant, Philadelphia, Pa.

Pacific Northwest

THE Pacific Northwest Section met February 28, 1958 at the Multnomah Hotel, Portland, Ore, with Chairman Thomas Kay Jr presiding. A business meeting, following a cocktail hour and dinner, was attended by 32 members and guests.

The following slate of officers was elected for 1958:

Chairman: Russell Koenig, Portland Woolen Mills

Vice chairman: Jack D Gilberg, General Chemical Div

Secretary: Paul J Pernice, Dyestuff & Chemical Div, General Aniline & Film Corp

Treasurer: Dale W Kimsey, Geigy Dyestuffs

Councilor: John L Ayres, E I duPont de Nemours & Co, Inc.

Mr Koenig expressed his thanks to the outgoing officers and particularly to retiring chairman Thomas Kay Jr for an excellent job in 1957. He also called for an intensified membership campaign in 1958.

The next meeting of the Section will be held April 22, at which time Section members and guests will have an opportunity to meet several national officers of the Association, who will be in attendance.

The 1958 outing will again be held at the Mt Hood Golf Course in late July or early August. The committee on arrangements will be the same as in 1957.

AATCC Calendar

COUNCIL
May 23 (Philadelphia, Pa); Sept 19 (Charlotte, NC); October 30 (Conrad Hilton Hotel, Chicago, Ill); May 1959 (Montreal, Canada)

NATIONAL CONVENTIONS
Oct 30-Nov 1, 1958 (Hotel Conrad Hilton, Chicago); Oct 8-10, 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa); September 28-30, 1961 (Buffalo, NY)

DELAWARE VALLEY SECTION
April 12 (Ladies Night), May 23 (Outing), Sept 12 (Wilmington Meeting), Oct 17, Dec 5

HUDSON-MOHAWK SECTION
May 16 (Ladies Night, Chelsea House, Tribes Hill, NY); June 20 (Annual Outing, Antler's Country Club, Ft Johnson, NY)

METROPOLITAN SECTION
April 18 (Kohler's Swiss Chalet, Rochelle Park, NJ; June 6 (Outing, North Jersey Country Club, Wayne Township, NJ)

MID-WEST SECTION
April 19 (Netherland Hilton Hotel, Cincinnati, O); June 13-14 (Outing—Browns Lake Resort, Burlington, Wis)

NIAGARA FRONTIER SECTION
Apr 11 (Joint meeting)

NORTHERN NEW ENGLAND SECTION
May 9 (Lowell Technological Institute, Lowell, Mass); Sept 12 (Outing—Wachusett Country Club, West Boylston, Mass); Oct 17 (QM Research & Development Ctr, Natick, Mass); Dec 5 (Hotel Vendome, Boston, Mass); Jan 16 (Colonial Club, Lynnfield, Mass)

PIEDMONT SECTION
Apr 25-26 (Washington Duke Hotel, Durham, NC); June 6-8 (Outing—Grove Park Inn, Asheville, NC); Sept 19-20 (Hotel Charlotte, Charlotte, NC)

RHODE ISLAND SECTION
Apr 25 (Students Night—Bradford Durfee College of Technology, Fall River, Mass); June 13 (25th Annual Outing—Wannamoisett Country Club); Sept 26 (Management Night—Warwick Country Club); Oct 23 (Providence Engineering Society); Dec 4 (Annual Meeting—Johnson's Hummocks Grille, Providence)

SOUTH CENTRAL SECTION
Mar 29 (Hotel Patten, Chattanooga, Tenn); May 30-31 (Summer outing—Hotel Greystone, Gatlinburg, Tenn); Sept 13 (Hotel Patten, Chattanooga, Tenn)

SOUTHEASTERN SECTION
Apr 19 (Alabama Polytechnic Institute, Auburn, Ala); June 6-7 (Summer outing—Radium Springs Lodge, Radium Springs, Ga); Sept 13 (Ida Cason Callaway Gardens, Chipley, Ga); Dec 6 (Atlanta, Ga)

WASHINGTON SECTION
April 11 (National Housing Center, Washington, DC)

WESTERN NEW ENGLAND SECTION
May 16 (Ladies Night—Rapp's Paradise Inn, Ansonia, Conn); June 13 (Outing—Wallingford Country Club, Wallingford, Conn); Sept 26 (Hartford, Conn); Oct 24 (Annual Meeting—Rapp's Restaurant, Shelton, Conn); Dec 5 (Rapp's Restaurant, Shelton, Conn)

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(deceased)

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STUDENT CHAPTERS

Alabama Polytechnic Institute, Bradford Durfee College of Technology, Clemson College, Georgia Institute of Technology, Lowell Technological Institute, New Bedford Institute of Technology, North Carolina State College, Philadelphia Textile Institute, Rhode Island School of Design

Abstracts

The Principles of Dyeing Orlon; Practical Methods of Dyeing Orlon

Parker, F. G. *Textile Recorder* **75**, 78, November, 1957; **75**, 69, December, 1957; *Dyer* **118**, 447-53, September 13, 1957.

In the first of these papers the author discusses the various types of dyes employed in dyeing Orlon type 42.

Disperse Dyes. Orlon can be dyed with selected disperse dyes to give unusually good fastness to light and washing, but the build-up of these dyes on Orlon is limited and their usefulness extends only to the pastel and light shades. They are applied from a boiling bath containing an anionic dispersing agent.

Cationic Dyes. All of the deeper shades, including blacks, are dyed with cationic or basic dyes. The new fast cationic dyes developed by Du Pont specifically for Orlon, called Sevron dyes, now number fifteen. In addition, two or three of the older basic types, such as Malachite Green and Fuchsine, are useful in heavy shades. These dyes are applied at the boil, with the addition of acetic acid, Glauber's salt, and a cationic leveling agent for light and medium shades. A table of the rate of dyeing of the various brands is included.

Orlon/wool. Cationic dyes are applied to the Orlon and acid dyes to the wool. If only the Orlon is to be dyed, selected dyes are used and the stain on the wool is removed later by scouring with acetic acid and a nonionic detergent. Acid dyes which leave the Orlon unstained are also available.

The dyeing of blends of Orlon with nylon, cellulosics, silk and acetate is also discussed.

Bleaching of Orlon, when necessary, can be achieved by an acid scour at the boil, with the application of a fluorescent white dye.

In finishing Orlon fabrics a modified UF-type of resin (Zeset S) is recommended for wrinkle resistance.

In the second paper the author describes the mill procedures and machinery recommended for dyeing Orlon in its various forms (stock, packages, skeins, piece goods, etc.).

Spun Orlon yarns can be dyed in either package or skein form, the former being preferred for regular shrinkage yarns (on the grounds of economy), while the latter system is essential for high-bulk yarns, since the shrinkage which ranges from 16 to 25 percent makes package dyeing impracticable. Sucessful skein-dyeing of high-bulk Orlon yarns requires submersion-type equipment, which is described.

Rhovyl: Polyvinyl Chloride Fibers

Hochstaedter, L. *Textile Research J.* **28**, 78-85, January, 1958.

Rhovyl, made from polyvinyl chloride by a dry spinning process, was developed by the Rhodiaceta Co of France. It is also being manufactured in Italy and Germany.

Four types (Rhovyl 55, Rhovyl 30, Rhovyl 15 and Rhovyl T) are produced by varying the molecular orientation, to give these fibers residual shrinkages of 55%, 30% 15%, and 0% respectively. Today Rhovyl 55 and Rhovyl T are being made commercially.

The principal properties of these fibers are nonflammability, high resistance to atmospheric and biological destructive agents and to a wide range of chemicals, and thermoplasticity.

Prolonged exposure to sunlight has little effect on the tensile strength. In this respect Rhovyl is comparable with Orlon. It is resistant to mineral acids (including aqua regia), strong alkalis, and oxidizing agents. A table of its physical properties is included.

Rhovyl may be dyed with selected disperse dyes, Naphthols and Indigosols. A list of suitable dyes is included. Dyeing may be carried on either before or after shrinkage. The author recommends dyeing Rhovyl 55, before shrinking, at 140°F, with addition of a carrier. Dyed after shrinkage, Rhovyl 55, like Rhovyl T, requires no carrier.

Rhovyl 55, which shrinks up to 55%, is most often used in industrial filters, bulk yarns for novelty effects (suede, three-dimensional fabrics, etc.), and wherever high resistance to abrasion is necessary.

Rhovyl T is Rhovyl which is preshrunk so as to be applicable to apparel fabrics, and is used where softness, crease resistance and compatibility in blends are desired.

Plastic Foams: a New Textile Material

Lynn, J. E. *Modern Textiles* **39**, 49-52, January, 1958.

The use of plastic foams as insulation in clothing is based on the discovery that insulation efficiency depends on retaining stagnant air cells in linings, and not on any inherent fiber properties.

A strong, flexible, thin plastic foam, durable to cleaning, readily fabricated, and resistant to the destructive forces of normal wearing is an ideal insulating material for winter clothing.

For textile use the foaming resins of most interest are Neoprene, vinyl chloride, modified vinyl chloride, and urethanes. The Neoprene and vinyl chlorides are compounded with plasticizers, stabilizers and vulcanizers and are normally expanded by using blowing agents which release nitrogen gas; the urethanes depend upon a chemical reaction between the isocyanate used and water to release carbon dioxide which causes the foaming.

The author gives details of the manufacture of these different types of foam, and presents a table, comparing the properties of three representative flexible foams offered for apparel use (urethane, modified vinyl chloride, and Neoprene rubber).

In general, the vinyl-type foams are produced by resin and plastic manufacturers and are supplied in finished form to the textile mills. While textile urethane foams can also be furnished by the resin manufacturers, these foams can be made by textile mills. This accounts for the present great interest in foams for textile use.

Urethane foams have ideal properties for this purpose, including resistance to chemicals and mechanical action and ready fabrication in normal clothing manufacturing operations. A 3/32 inch, 3 oz per sq yd sheet of urethane foam interlining is said to have the same insulating value as 14-16 oz per sq yd of wool.

The author predicts a rapid expansion in the use of these materials.

Color in Writing and Copying

Gill, J. P. *Dyer* **119**, 102, January 17, 1958.

Outlining the long history of writing inks, the speaker referred to the use of dispersions of lamp black or carbon by the Egyptians 5000 years ago, and the introduction of iron tannate as coloring matter in the 9th century. The later inks in which iron tannate was not oxidized until it had been written were a further step forward. Modern inks of this type are quite complex solutions of iron salts with tannic or gallic acids, sometimes an infusion of galls, a certain amount of mineral acid, phenol as preserva-

tive, gum arabic to adjust the viscosity, and dyestuff to give a sighting effect before development of the black color. The dye has to be stable to the other ingredients.

For colored inks, acid dyes of good solubility and stability are used, also selected direct dyes which have affinity for paper and are therefore faster to water. For architects' drawings, to obtain greater permanency, aqueous dispersions of pigments are used.

The speaker described some of the problems encountered in developing a suitable ink for ball pens. Since the amount of ink deposited on the paper from such a pen is small, the concentration of dyestuff necessary in the ink must be very high. The ink must function as a lubricant between the ball and its housing; it should be completely free from solid particles which might jam in the housing; and the viscosity must be just right. Earlier types of ball-pen ink had extremely low lightfastness and a tendency to mark off. The more recent inks are based on solvents of the glycol class and contain dyes of good lightfastness.

A typical ink for typewriter ribbons contains peanut oil, sperm oil, and mineral oil. The most widely used pigment for the coloring matter is carbon black.

The speaker also discussed the colors used in the production of carbon paper and hectograph papers.

Infrared Properties of Dyestuffs; Interesting Aspects of Military Camouflage Methods

Ganz, E, *Dyer* **119**, 167-72, January 31, 1958.

Modern warfare has put an end to the traditional colored uniform of the soldier, and camouflage as we know it came into its own in World War I. Methods of camouflage are based on two main principles: first, using flat shades, such as khaki or field gray, in order to break up contrasts against natural surroundings; and second, concealing contours of objects by means of bizarre patterns.

Camouflage was eventually developed to such a fine art that new techniques of detecting military targets had to be found, one of them being the infrared technique.

The three methods of observation which have generally been adopted for military use are 1) infrared photography, 2) infrared night-observation instruments, 3) direct visual observation with red filters.

Photographic plates and films can be made sensitive to infrared rays. Photographs taken with an infrared filter, which absorbs ultraviolet and visible radiation, show marked changes in the depths of tone of various objects; deciduous trees and grass appear very light, whereas coniferous trees, soil, and water surfaces show up dark. Dyeings used for camouflage purposes also exhibit widely varying behavior in infrared photography.

Infrared equipment is also suitable for taking photographs over long distances under hazy conditions. It is therefore useful in aerial reconnaissance for detecting airfields, factories, etc. The nets used for camouflaging large installations must have the same infrared reflectance as their surroundings to avoid detection.

Infrared searchlights have been developed for night observation in complete darkness. The radiations emitted by the searchlight pass through filters which absorb all visible and short-wave rays. The long-wave infrared radiation passes through the filters, irradiates the objective, and is partly reflected back onto a cathode ray tube. The operation of this device, which produces a visible image on a fluorescent screen, is described.

Direct visual observation makes use of closely fitting, dark red goggles. Unsuitably camouflaged objects, both moving and stationary, can be readily detected in broad daylight by this simple method.

The author describes the spectrophotometric principles on which these procedures are based, and gives full details concerning the correct selection and blending of dyes to obtain suitable infrared properties. Vat and sulfur dyes are the ones mainly used on cotton and other cellulosic fibers. Most wool dyes do not absorb sufficient infrared, but the required infrared reflectance can be obtained by blending with suitably dyed viscose or synthetic fibers.

It is also pointed out that the degree of infrared reflectance of dyeings is affected by certain water-repellent, rotproof, and flameproof finishes.

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General Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
(1958 Gordon Research Conference on Textiles—July 7-11, Colby Jr College, New London, NH)

AMERICAN OIL CHEMISTS SOCIETY
April 21-23 (49th Annual Meeting, Peabody Hotel, Memphis, Tenn); July 14-18 (Short course on soaps and synthetic detergents, Princeton Inn, Princeton, NJ); Oct 20-22 (Sherman Hotel, Chicago); April 20-22, 1959 (Roosevelt Hotel, New Orleans, La); Sept 28-30 (Statler Hotel, Los Angeles, Calif)

AMERICAN SOCIETY FOR TESTING MATERIALS (COMMITTEE D-13)
Oct 14-17 (Sheraton McAlpin Hotel, New York, N Y)

THE DRYSALTERS CLUB OF NEW ENGLAND
May 2 (Hotel Vendome, Boston, Mass); June 20 (Outing—Wachusett Country Club, West Boylston, Mass)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
June 9-12 (National Conference on Materials Handling, Public Auditorium, Cleveland, O)

CANADIAN TEXTILE CONFERENCE
May 6-8 (Queen Elizabeth Hotel, Montreal, Quebec)

DIVISION OF CLOTHING AND TEXTILES IN EXTENSION, TEACHING AND RESEARCH, UNIVERSITY OF GEORGIA
Nov 7-8 (2nd Textile Seminar, Georgia Center for Countinuing Education, Athens, Ga)

THE FIBER SOCIETY
April 30-May 1 (The Clemson House, Clemson SC); Sept 9-10 (Montreal, Que)

INSTRUMENT SOCIETY OF AMERICA
May 12-14 (Analysis Instrumentation Division Symposium, Shamrock Hilton Hotel, Houston, Texas)

INTERNATIONAL TEXTILE MACHINERY EXHIBITION
Oct 12-15 (Belle Vue, Manchester, England)

DELTA KAPPA PHI FRATERNITY
April 24-26 (New Bedford Hotel, New Bedford, Mass)

LAUNDRY, DRYCLEANING AND ALLIED TRADES' EXHIBITION
July 17-26 (Olympia, London, England)

MANUFACTURING CHEMISTS' ASSOCIATION
June 12-14 (86th Annual Meeting, The Greenbrier, White Sulphur Springs, W Va)

NATIONAL ASSOCIATION OF HOSIERY MANUACTURERS
April 21-22 (Annual Meeting and Hosiery Industry Conference, Hotel Roanoke, Roanoke, Va)

NATIONAL COTTON COUNCIL OF AMERICA
Oct 1-2 (Chemical Finishing Conference, Washington, DC)

PURDUE INDUSTRIAL WASTE CONFERENCE
May 5-7 (Purdue Memorial Union Bldg, Purdue Univ, Lafayette, Ind)

SOUTHERN TEXTILE EXPOSITION
Oct 6-10 (Greenville, SC)

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Luncheon meetings at the Hotel Roosevelt, New York, NY: April 8, June 10, Sept 9, Oct 8, Nov 12. Outing: May 26-28, Shawnee Inn, Shawnee, Pa

TEXTILE INSTITUTE
April 23 (Annual Meeting, Nottingham, England)

TUFTED TEXTILE MANUFACTURERS ASSOCIATION
June 5-7 (Dayton Plaza Hotel, Daytona Beach, Fla)

News of the Trade

NAFTF-AIL Committee Explore Wash-and-Wear Trends

The first of which is believed will be a series of meetings was held Wednesday, March 19th, by a Policy Committee representing the National Association of Finishers of Textile Fabrics and the American Institute of Laundering in the Empire State Club, New York, NY. The purpose of the Meeting was to explore current wash-and-wear trends in cotton with special emphasis on problems pertaining to chlorine retention and to yellowing of some finishes when applied to whites as well as prints and woven designs containing white areas. These problems are said to be developing both under home and professional methods of laundering, especially with the use of the urea-formaldehyde types of finish.

The joint committee hopes to come up eventually with practical suggestions which will minimize the problem for consumers.

Representing the NAFTF were: J M Cole (Chairman), Cold Spring Bly; Ernest J Chornyei, Bradford Dyeing Assoc; Sydney M Cone Jr, Cone Mills Corp; W R MacIntyre, Jos Bancroft & Sons Co; Arthur G Poor, Standard Bly & Prtg Co; C J Quinn, Sayles Finishing Plants, Inc; Julian Robertson, North Carolina Fin Co; and Joseph E Hoesl, secretary of NAFTF.

Members of the AIL group included: Robert Maslish, Rite-Way Laundry, Brooklyn, NY; L J Haviland, Morey LaRu Laundry, Elizabeth, NJ; Ralph Smith, New Jersey Laundry and Cleaning Institute; and Ward A Gill and George H Johnson, American Institute of Laundering.

Another committee meeting is planned within the next two months.

86th Annual Meeting, MCA

The 86th Annual Meeting of the Manufacturing Chemists Association will be held June 12-14 at The Greenbrier, White Sulphur Springs, W Va.

It is anticipated that more than 700 chemical industry executives will attend.

S B Penick Jr, president, S B Penick & Co, New York, is program chairman.

The MCA is an industry group representing more than 90 percent of the chemical production capacity in the United States.

Catalin Offering Chemical Intermediates and Specialties

Fourteen chemical intermediates and specialties have been made available by Catalin Corporation of America, which has entered the field as a result of a highly intensified program of research and development conducted at the company's expanded laboratories at Fords, NJ. In addition to this program, a recent cross licensing agreement between Catalin and Societe Francaise D'Organo-Synthese calls for an exchange of technical information and formulas for chemical intermediates.

Inquiries from manufacturers using these chemicals in research and production processes should be directed to: Catalin Corporation of America, Chemical Division, One Park Avenue, New York 16, NY.

SDC Buys Into Brazilian Dyestuffs Firm

Southern Dyestuff Corp, Charlotte, NC, has purchased half interest in Naegeli & Cia, Ltda of Rio de Janeiro, Brazilian dyestuff manufacturers.

The newly formed company will be known as Naegeli S A. The Brazilian company reputedly is the oldest established dyestuff manufacturing concern in South America, having been organized in 1912 by the Naegeli family. Sons of the founder will continue to head the company.

Naegeli S A will expand its line of sulfur dyestuffs and will add a number of newer dyestuffs similar to those produced by Southern Dyestuff Corp in the United States.

In addition to capital contribution, Southern Dyestuff Corp has made available to Naegeli S A modern dyestuff manufacturing equipment. This new Brazilian company will be authorized to operate under a number of Southern Dyestuff Corp's patents and processes.

Leland G Atkins, president of Southern Dyestuff Corp, has stated that Brazil has a steadily growing textile industry and little dyestuff production of its own. He is confident of a growth potential in that market.

Dyestuffs produced by Naegeli S A will be marketed under the trademarks of Sodyeco and Asphalen in order to continue the identity of products known to the Brazilian textile trade.

Ansbacher-Siegle Sets up New Textile Color Department

Ansbacher-Siegle Corp has established a new Textile Color Department, specially created to furnish pigments, colors, dyestuffs and clears to the textile industry and those serving the textile industry.

In making the announcement, Eric N Blackstead, vice president of Sun Chemical Corporation, the parent company, stated that all textile color operations within Sun Chemical have been consolidated and integrated into a single, specialized department to provide better service and a wider range of color products for the textile industry. The newly combined operation will function as a department of Ansbacher-Siegle and will be concerned with the development of sales of such products as: Suntones, textile printing colors and clears; Ansigen, azoic dyestuff solutions; Ansibase, stabilized bases, pigment slurries and presscakes.

Justus Hoyt has been appointed as product manager, to head the new department. Prior to this new appointment he was general manager of Sun's pigment division. The Textile Color Department will be located for the present at 309 Sussex Street, Harrison, NJ.

GDGA Annual Clinic

Guest speakers at the recent annual clinic of the Garment Dyers Guild of America included Paul Meunier, associate director, Technical Laboratory, E I duPont de Nemours & Co, Inc; Burt F Faris, supervisor, customer service, Textile Fibers Dept, E I duPont de Nemours & Co, Inc; Gerald Laxer, director of science & technology, The Wool Bureau, Inc; and Oscar Howard, field representative, Illinois State Cleaners & Dyers Assoc.

This year's clinic was held Feb 13-15 with the Almore Dye House, Inc, Chicago, Ill, serving as host. These clinics are held at different member plants each year. The various dyeing processes are observed for two days, following which technical discussions are conducted with direct reference to the work being done at the host dyehouse.

Newly elected officers of the GDGA include Leon Teichner, Almore Dye House, Inc, president; Gabriel Ollovsky, Tru-Color Dye Works, Long Island City, NY, vice president; and Mrs Lucien Dietrich, Dietrich Dyers, St Louis, Mo, secretary-treasurer.

Heyden Newport Sells St Maurice Holdings

The sale by Heyden Newport Chemical Corporation of its 50% interest in St Maurice Chemicals, Ltd, of Canada, to the Shawinigan Water and Power Company in exchange for 75,000 shares of Shawinigan common stock, was confirmed recently by Simon Askin, Heyden Newport president.

St Maurice manufactures formaldehyde, pentaerythritol and polypentaerythritols at Varennes, Quebec. The plant was constructed with Heyden's technical assistance, and Heyden Newport will continue to make available its patents and technical knowledges, Mr Askin stated.

He also reported that the disposition of Heyden Newport's 50% interest in The McArthur Chemical Co, Ltd, a Canadian affiliate of St Maurice, is being negotiated.

TRI Hosts NCTE

The National Council for Textile Education met at Princeton, NJ, last month with Textile Research Institute acting as host.

The Council, headed by Cleveland L Adams, is made up of administrative officials of the following twelve colleges and graduate schools offering textile courses: Alabama Polytechnic Institute, Bradford Durfee College of Technology, Clemson College, Institute of Textile Technology, Lowell Technological Institute, New Bedford Institute of Technology, North Carolina State College, Philadelphia Textile Inustitute, Rhode Island School of Design, Texas Technological College, and Textile Research Institute.

An important item on the agenda was a discussion of the final report of a survey of the textile industry's educational requirements, made by Arthur D Little, Inc under the sponsorship of Burlington Industries, Inc. Council members also had the opportunity of touring the TRI laboratories and other research institutions in Princeton.

NSP Moves to Larger Quarters

National Starch Products Inc is now occupying new and larger quarters in a recently completed 34-story building at 750 Third Ave, New York 17, NY. (Telephone: YUkon 6-9500).

National Starch Products is a leading producer of corn starches, vinyl resins and adhesives. It has several plants in the United States and Canada plus foreign operations in England and Holland. National's research and development facilities are located at Plainfield, NJ.

G E Goheen, assistant director of the Southern Utilization Research and Development Division of the Agricultural Research Service, USDA, explains to the Maid of Cotton for 1958, Jean Carter, some of the principles of chemistry by which such transformations of cotton into a variety of "new" fibers take place and describes creaseproof finishes imparted to cotton fabrics by chemical treatment. While visiting SURDD, the Maid also saw cottons which by chemical treatments have been made resistant to flame and resistant to penetration and staining by oil and grease.

Cotton garments with a "wash and wear" finish come out of the laundry with crisp creases and neat, flat seams when treated by a process under development at the Southern Utilization Research and Development Division of the Agricultural Research Service, USDA. J David Reid, chemist in charge of the group working on this process, explains to Jean Carter, 1958 Maid of Cotton, that by treating a garment after it has been made up, then curing the finish, seams can be pressed smooth and flat and creases cured in where they are wanted, so that the garment always has a freshly ironed appearance. Research is now under way to develop a method for applying the treatment in commercial drycleaning plants.

1958 Gordon Research Conference on Textiles

Emery I Valko will serve as chairman, and Leonard Smith as vice chairman, of the 1958 Gordon Research Conference on Textiles, scheduled for July 7-11 at Colby Junior College, New London, NH.

The program:

July 7—"Deformation Mechanism of Polymers," H Mark; "Tension Changes in Textile Structures during Wetting and Drying," Norman J Abbott and Freddy Khoury.

July 8—"The Structure and Properties of Viscose Rayons," W A Sisson; "Elastic Textile Fibers Based on Condensation Polymers," R E Seaman and J C Shivers.

July 9—"Relationships between Mechanical Behavior and Chemical Modification of Cotton," C M Conrad; "Some New Results in Wool Chemistry," Helmut Zahn.

July 10—"Movement of Fluids in Fibrous Beds: Capillary Sorption, Permeation," A A Burgeni and E V Painter; "The Transport of Liquids in Textile Assemblies," F W Minor, L C Buckles, E Wulkow, and A M Schwartz.

July 11—"Mechanism of Fiber and Yarn Lubrication," C Schlatter.

Individuals interested in attending the Conference are requested to send their applications to the director. Each applicant must state the institution or company with which he is connected and the type of work in which he is most interested. Attendance at the Conference is limited to 100.

Requests for attendance, or for any additional information, should be addressed to W George Parks, director, Dept of Chemistry, Univ of Rhode Island, Kingston, RI. From June 9, mail should be addressed to Colby Junior College, New London, NH.

13th Purdue Industrial Waste Conference

The 13th Purdue Industrial Waste Conference, which will be held May 5-7 in the Purdue Memorial Union Building, Purdue Univ, Lafayette, Ind, will feature approximately fifty papers on subjects dealing with industrial wastes and their treatment.

Hotel reservations can be made with the Purdue Union Club, Fowler Hotel, Cedar Crest Hotel and Morris Bryant Hotel.

For further information, contact: Don E Bloodgood, professor of sanitary engineering, Purdue Univ.

NATTCC "Lifts" Heart Fund Drive

The National Association of Textile and Textile Chemical Cardiacs, of which AATCC President Geo O Linberg is "president and founder" and of which all members are vice presidents, is a humorous and unusual approach to an important problem.

Upon examining a prospectus of the membership qualifications and constitution of the "Association," Charles A Gates, executive director of The Massachusetts Heart Association, Inc, wrote to Mr Linberg, stating that "We at the state headquarters of the Heart Association got a terrific lift out of your prospectus describing the NATTCC. Everybody agrees that you have a delightful sense of humor which you have coupled with a very important and serious problem."

Membership qualifications are as follows:

I. An applicant for membership shall be a person of any age and either sex having been employed in the field of Textiles or Textile Chemistry.

II. An applicant must agree at the time of application for membership, to submit to the President each year a letter attesting to the contribution of at least Ten Dollars to the Heart Fund.

III. An applicant must further agree to do all in his or her power to encourage others having had physical (not emotional) heart attacks.

Article V of the Constitution states that "The affairs of the Society shall be governed by the President and Vice Presidents. As all members are Vice Presidents, democracy is assured."

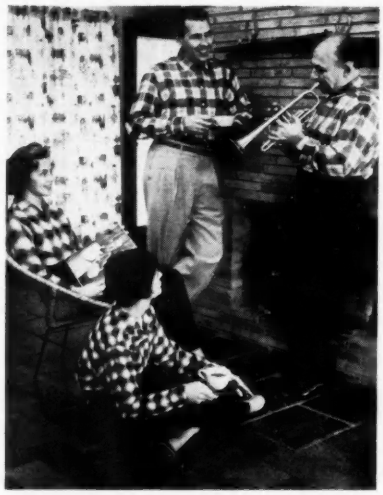
Newest Fabulized Licensees

Two Reading, Pa, firms have been signed as the latest Fabulized licensees, according to John L Fancourt, president of Fabulized, Inc.

The firms are: Fleetwood Hosiery Co, which specializes in men's hosiery and children's anklets, and William G Stolz & Sons, Inc, hosiery dyers.

PTI Loan for Student Union Bldg Approved by HHFA

The Philadelphia Textile Institute's application to the Federal College Housing Program of the Housing and Home Finance Agency for a loan of $450,000 as partial payment for the erection of a Student Union Building has been approved. The new building will be erected on the 3¾ acres purchased in 1957 on the corner across Henry Avenue from the present campus.



New, lightweight "Game and Lake" leisure shirts, in which as many as seven color-dyed yarns are blended into subtle shadings, are worn here by famous Dixieland jazz cornetist Doc Evans (right) and three of his fans at an informal get-together. First in the industry to feature the oil-repellent and water-repellent "Spotless Look" of Scotchgard brand stain-repeller in their shirts tailored from North Star wool fabrics, the Bloch-Heller Co, Minneapolis, Minn, makers of "Game and Lake" originals, are also noted for their imported Lanerossi line. The shirts had their first showing at the National Association of Retail Clothiers and Furnishers Convention at Chicago, February 23-25. They are priced from $13.95. Scotchgard stain-repeller is a product of Minnesota Mining and Manufacturing Co.

International Symposium on Instrumental Methods of Analysis

The Analysis Instrumentation Division of the Instrument Society of America will hold its annual Symposium on May 12, 13 and 14 at the Shamrock Hilton Hotel, Houston, Texas. The subject will be "New Principles in Instrumental Methods of Analysis", and there will be symposia on Optical Methods of Analysis, Mass Spectrometry, Chemical Methods of Analysis, Process Stream Analyzers, and Gas Chromatography.

The first day's program will consist of papers of general interest in the field. On the remaining two days, there will be concurrent sessions on specific topics, with briefer, more specialized papers. Papers are being solicited by R D Eanes, Program Chairman, c/o Leeds & Northrup Company, Philadelphia 44, Pa.

Advance registration for the Conference (fee $20) may be made through H S Kindler, ISA Director of Technical Programs, 313 6th Ave, Pittsburgh, Penna. Advance hotel reservations may be made through ISA Reservation Manager, The Shamrock Hilton, Houston 1, Texas.

NCSC School of Textiles Open House

Visitors estimated at more than 2,000 viewed textile products ranging from gauze to elaborate tapestries and observed research functions embracing the latest techniques of science during the annual "Open House" program of the School of Textiles at North Carolina State College Saturday, March 1.

The Nelson Textile Building was the site of the day-long observance which included fashion shows depicting the newest creations of fabric designers, exhibits staged by leading textile manufacturers, and continuous tours revealing trends in the nation's textile industry.

Among the displays was an old necktie machine used for knitting Orlon substitutes for the human heart's principal artery—the aorta and Y-shaped aortic arch.

Celanese Corp of America and the Chemstrand Corporation demonstrated the production of synthetic fibers with both wet and dry spinning units. Seven other industrial firms joined the college in showing production processes through the finishing of woven and knitted cloth. Displaying a diversity of products were Burlington Industries, Cone Mills, Fieldcrest Mills, Fair-Tex Mills, Morgan-Jones Co, Pinehurst Textiles, and J P Stevens Co.

Aside from the demonstrations and industrial exhibits, visitors got a look at fabrics gathered from throughout the world and displayed in State College's newly established "William H Harriss Collection of Modern Fabrics," given to the college by Cluett, Peabody and Co, in honor of William H Harriss, veteran company official and 1895 graduate of State College.

Sponsor of the "Open House" was the Tompkins Textile Council, headed by George Cochran, a senior at the college.

Univ of Georgia Textile Seminar

The University of Georgia's Divisions of Clothing and Textiles in Extension, Teaching and Research is planning for its second Textile Seminar, which will be held Nov 7-8 at the Georgia Center for Continuing Education, Athens, Ga.

The purposes of these seminars at present are to develop a better understanding of consumer problems in textiles confronting home economists, retailers and industry, and to provide basic information and new information concerning fabrics and finishes.

• NAMES IN THE NEWS •

Emelin

The election of **Harold E Smith** as chairman of the board of directors of the Wallerstein Company, Inc, New York, became effective March 13. Succeeding Mr Smith as president and chief executive officer of the company is **Arthur C Emelin**, former general manager of the J B Roerig & Co Division of Chas Pfizer & Co, Inc.

John G Sibley has been named to the newly created post of Southern regional manager of Jefferson Chemical Company, Inc. At the same time, **William P Thorp III** has been designated resident salesman at the company's Charlotte, NC, office. Both appointments became effective April 1.

Mr Sibley has served since 1956 as district sales manager in Charlotte. His headquarters will be at Houston, Texas. Mr Thorp joined Jefferson Chemical in 1957.

Allan A Titus has been named to the staff of Banco, Inc., the New York sales organization for Joseph Bancroft & Sons Co.

Prior to joining Banco, Mr Titus served as New York sales manager of Apponaug Company.

Robert E Leber has been appointed general sales manager of Ansbacher-Siegle Corp, Staten Island, NY.

Mr Leber will be located at the company's headquarters in Rosebank, Staten Island, New York.

Mr Leber will work for **F W May**, who was recently appointed general manager of Ansbacher-Siegle Corp.

Leber

Robert L Duncan has been named sales manager of Union Carbide Chemicals Company, Division of Union Carbide Corporation. Prior to assuming management of Carbide's field sales force, Mr Duncan was assistant sales manager.

Mr Duncan joined Carbide in 1937, and except for military service, has served continuously in various sales capacities.

John C Lawler has been named special projects coordinator of the Dyestuff and Chemical Division of General Aniline & Film Corp. He will be a member of the staff of **C C Schulze**, manager of manufacturing for the Division.

Prior to his new position, Dr Lawler had been technical coordinator at GAF's Linden, NJ, plant. He will make his office at the headquarters of the Dyestuff and Chemical Division at 435 Hudson Street, New York.

Sperber

Parsons

Warwick Chemical Division of Sun Chemical Corporation has announced the appointment of **Stuart L Sperber** to the Sales Promotion Department. Mr Sperber was previously associated with Warwick and returns to supervise the sales promotion and advertising programs of Warwick's water repellents.

Tarlton F Parsons, manager of the Converter Relations Department, has been appointed to direct Warwick's new Permafresh resins wash and wear campaign. This campaign will be directed toward the industry's leading mills, converters and manufacturers.

E Perkins Maguire, Assistant Secretary of Defense, will be the featured speaker at the 55th Annual Convention of Phi Psi, national textile fraternity. Mr Maguire will address the group on Saturday, April 26, at the annual banquet. The convention starts Thursday, April 24, and is being held this year at the Benjamin Franklin Hotel in Philadelphia.

Manheim

Ciba Co, Inc, New York, has announced the appointment of **Theodore B Manheim** to the new post of supervisor of chemical specialties sales. In this capacity Mr Manheim is responsible for market research and sales of Ciba's textile processing products. Emphasis is being placed on resin finishes, fabric softeners, dyeing assistants, dye aftertreating products and fluorescent brighteners.

In textile processing and related fields, Mr Manheim has served as technical service chemist with Scholler Bros, Inc; as consultant with the High Polymer Division of the Naval Air Materiel Center, primarily on flame and mildew retardants; as sales engineer in corrosion prevention with Dearborn Chemical Co and as assistant manager of textile sales with E F Houghton Co.

Lawrence J Horan has been named manager of the Southeastern Division of National Starch Products Inc with headquarters in Atlanta, Ga.

In his new assignment, Mr Horan will be responsible for overall operation and supervision of the textile, paper, and adhesive sales and technical service groups. He will also work on the promotion of specific products for these fields.

From January 1956 until his present appointment Mr Horan served as district supervisor, New York Sales. His present territory includes Virginia, North and South Carolina, Georgia, Alabama, Florida and eastern Tennessee.

Horan

Scouring Raw Wool With Nonionic Termed "Economically Attractive"

"Very reasonable cost" of neutral scouring raw wool with Synthrapol PWS has been cited by Arnold, Hoffman & Co, Inc, noting that its nonionic surface-active agent has proved to be "efficient from a technical point of view as well as attractive economically."

Semibulk trials carried out in an independent research laboratory reportedly have shown that, through use of nonionics, such as Synthrapol PWS, and Glauber's salt as neutral scouring agents, operating cost can be reduced to about one-third the cost calculated for the conventional soap-and-soda scour in a four-bowl machine. Over a range of types of wools, the report estimates, processing costs may be lowered by at least 50% through use of nonionics.

It is claimed that a prime benefit in scouring raw wool under neutral conditions is that alkali damage is avoided, and consequently, the processed fiber has a better color and handle. Neutral scouring with Synthrapol PWS is effective and economical in the large four-bowl machines, and is of even greater interest to plants operating two-bowl machines, it is stated.

In the usual two-bowl machine operation, it is said to be almost impossible to rinse away adequately alkali used in the first bowl, since mechanical carry-over causes a build-up in the second bowl. When no alkali is used, however, as in scouring with Synthrapol PWS, it is said to be possible to scour at a much higher temperature without damage to the wool. For this process, Arnold, Hoffman has found a temperature of 150 to 160°F in the first bowl to be advantageous.

Scouring by this process reportedly supplies wool which requires approximately 0.5% less acid in dyeing, as this amount of acid is normally needed to neutralize the amount of alkali carried forward in scoured wool.

With respect to addition of inorganic salts to Synthrapol PWS as noted above, experience reportedly has shown that their inclusion in quantities ranging from equal parts to ten times the weight of the detergent leads to a significant increase in the efficiency of the nonionic agent. Choice of salts is limited by cost factors to common salt and Glauber's salt, and Arnold, Hoffman recommends use of the latter to avoid the possible corrosive effect of common salt on some scouring machinery.

Through extensive bulk trials in which excellent results reportedly have been obtained, formulas have been developed for wool scouring with Synthrapol PWS in both four-bowl and two-bowl machines. Further information is available from Arnold-Hoffman & Co, Inc, Providence, R I.

Lurasan

Lurasan, a new textile softener and lubricant developed by Onyx Oil and Chemical Co, is described as a low-cost anionic paste that has powerful softening properties, and is characterized by its ease of solubility and excellent resistance to yellowing due to heat.

In addition to its use as a general textile softener and lubricant, it is said to be particularly successful as a softener on cotton with chlorine-resistant resin finishes, as a lubricant and plasticizer on cotton for texturing and mechanical effects, and in general fabric applications for gaining attractive luster in napping and for preventing boardiness during heat setting.

A white paste, Lurasan has a pH of 9.0-9.5 and a density of 0.96, 8.0 lbs per gallon. Onyx suggests that it can be applied to "wash and wear" cottons for improved sewability and tear strength, to general cottons and rayon; for napping on cotton and synthetics; as a yarn softener in package dyeing; and as a top softener for resin-treated fabrics.

A technical data sheet fully describing Lurasan can be obtained from Onyx Oil & Chemical Co, 190 Warren Street, Jersey City 2, NJ.

Melotone O

Proctor Chemical Co, Inc, Salisbury, NC, has announced the addition of a combination anionic softener and detergent to its selling range. The new product, Melotone O, reportedly has excellent resistance to yellowing and does not affect the shade, or light and washfastness of dyed yarn.

It is claimed that the combination of softness and detergency enables the dryer to finish package-dyed and bleached yarn in one operation rather than the two operations generally required for soaping off and softening.

Durable Syl-mer Finish for Cotton Apparel Fabrics

A silicone finish which is said to be durable to both washing and drycleaning has been developed for cottons and cotton blends by Dow Corning Corp, Midland, Mich. It is claimed that the new finish can be easily applied on conventional equipment and does not require after-washing or treatment to develop excellent water repellency. Cost of application is considered competitive to existing durable repellents.

Up to now, silicone finishes have been used extensively on synthetics, blends, and woolen fabrics to improve hand and impart water and spot resistance, as well as other advantages, such as wrinkle resistance and crease retention. Lack of adequate durability to high-temperature machine washing, however, limited silicones to drycleanable fabrics or those that could be hand washed.

Dow Corning plans to market the new product under their brand name Syl-Mer, the eighth in the line of Syl-Mer products available for finishing woven or knitted fabrics.

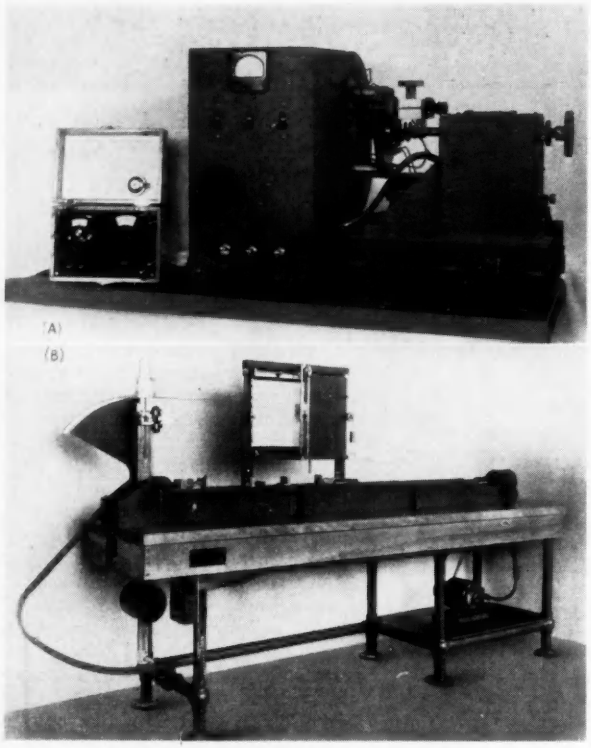
Dow Corning developed this new product after more than five years of extensive laboratory research. It has been run on a mill-trial scale at Cramerton Division of Burlington Industries, Fairforest Division of Reeves Brothers, Cranston Print Works, and Mission Valley Mills. Runs are currently being conducted at Dan River Mills.

Results reportedly have shown that the new finish meets the high durability standards to washing and drycleaning required by Syl-Mer products and also imparts a smoother and fuller hand to a wide range of cotton and cotton blend fabrics.

It is expected that a limited yardage of Syl-Mer processed cotton fabric will be available for fall cutting. Full production of the product soon should assure unlimited fabric volume for Spring 1959 lines.

Emkalon RF

Emkay Chemical Co, Elizabeth, NJ, has introduced a new resin softener, Emkalon RF, which is described as a nonionic polyethylene softener finish suitable for use alone or with thermosetting resins. It is said to possess excellent resistance to discoloration with high heat, and a minimum of chlorine retention.



(A) Dynamic Flexometer
(B) Autographic fiber tensile tester

Scott Testers' Model BM Crimp Tester

Textile Fiber Cord Testing Equipment Source

Autographic fiber - tensile - testing machines, Dynamic Flexometers, and other special research and development equipment is now available on special order to customer's blueprints from the Custom Contract Division of Abrasive Machine Tool Co, East Providence, RI.

The two machines illustrated were originally designed to the specifications of the Goodyear Tire and Rubber Co. In addition to Goodyear, the U S Bureau of Standards now also uses the Autographic tensile-testing machine for testing and recording breaking strength of fiber cord. The equipment is said to automatically pen record on a graph chart the stretch in fractions of inches and the breaking point in pounds and ounces of any size cord. It is powered by a one-quarter horsepower motor, and a precision cut screw, reportedly providing an even stretch for precise recording.

The Dynamic Flexometer, now in use at Goodyear, tests and records the flexibility of textile cord under variably controlled heat. A reciprocating magnet provides vibration for flexing and an intricate recording mechanism tabulates the number of times a cord is flexed before reaching the breaking point.

Model BM Crimp Tester

The replacement of cotton by synthetics in duck has rejuvenated the need for a simple device for evaluating "crimp," which is defined as the difference in distance between two points on a yarn as it lies in the fabric and the distance between the same two points after the yarn has been removed from the fabric and extended under a predetermined load.

Scott Testers, Inc now offers Model BM Crimp Tester, which reportedly conforms to standard ASTM Crimp Test Method. This new Scott offering is said to duplicate a tester which had proven highly satisfactory at Brighton Mills in crimp studies, combining simplicity of construction, simplicity of operation and accurate determination of value. Originated by Brighton around the close of World War I, these testers were extensively used in their production and also by their suppliers and customers.

To accomplish the test, a loop of yarn is used as the test specimen, draped over a fixed top support and hooked to the bottom of a movable vertical shaft. Actuated by the yarn loop, the vertical shaft activates the dial pointer, indicating the percentage of crimp.

The machine is compact (weight 5 lbs, height 13½") and requires no auxiliary equipment. Provision is made for imposing additional weights to the initial 25-gram weight incorporated in the shaft. Complete details from Scott Testers, Inc, 63 Blackstone St, Providence, RI.

"Jet Stream" Tenter Housing

James Hunter Machine Co's new "Jet Stream" Tenter Housing reportedly embodies entirely new design and construction features, developed as a result of recently completed extensive studies of existing nozzle drying systems.

It is said to provide a maximum evaporative capacity, using either steam or a gas-fired heat source. Heavy-duty fans are mounted overhead with heaters and screens in a penthouse. Plenum chambers located above and below the tenter frame split the air. Nozzles are placed to provide maximum heated-air velocity, and still permit return air to travel at a low rate of speed.

These refinements in "Jet Stream" Tenter Housing are said to permit an even application of heat to be maintained across the width of the fabric. Migration of resins and dyestuffs is eliminated, and excessive drying at cloth edges is avoided, it is claimed.

The "Jet Stream" is designed to fit any conventional clip tenter frame.

Chemigum Latex 248

Chemigum Latex 248, a medium nitrile-content butadiene/acrylonitrile latex developed to meet the need for a high solids product possessing good color stability, has been introduced by the Chemical Division of The Goodyear Tire & Rubber Company.

A general purpose latex, it contains a synthetic surfactant-type emulsification system which reportedly promotes stability during compounding and processing. In addition, Chemigum Latex 248 is said to exhibit exceptional resistance to light aging and heat deterioration.

Improved production techniques have introduced high solids content in the new Goodyear latex. Preparation of high solids compounds is thereby simplified and pigmented formulations at 60-65 percent solids utilizing the new latex are being used commercially, it is stated. Advantages realized with such compounds reportedly include higher coating weight per pass and reduced drying requirements.

Chemigum Latex 248, it is claimed, can be used directly as shipped or with the addition of small amounts of thickener. Goodyear states that the Chemigum family of latices can be used in uncured form because of the chemical nature of the polymer and the highly efficient antioxidant system added during latex production.

This new latex also may be used in conjunction with Pliovic Latex 300, a vinyl chloride copolymer also produced by the Goodyear Chemical Division. The two latices combine under fusion conditions to plasticize or reinforce each other. Blends of Chemigum and Pliovic latices are used in nonwoven fabric production. Varying the ratio of the two latices reportedly permits exacting control of stiffness and hand in the finished product.

Because of the adhesion and fiber-binding characteristics of Chemigum Latex 248, Goodyear suggests its use in textile inks, nonwoven fabrics, textile back-coatings and sizings, carpet backings, etc.

It is now commercially available in drum or bulk quantities with prices following the same schedule employed for other medium nitrile content latices in the Chemigum family.

Synthogum PR

Hart Products Corp has announced the development of Synthogum PR, a new synthetic resin gum in powdered form. It reportedly contains 90% active material and combines high viscosity characteristics with ease of solution.

Synthogum PR is said to dissolve readily to yield dilute solutions of high viscosity recommended for the preparation of printing pastes for screen and roller printing. Being a completely synthetic gum, Synthogum PR has a high degree of uniformity and contains no impurities associated with natural gums, it is claimed. Its low cost compared with natural gums reportedly makes it highly economical for all printing and thickening applications in the textile industry.

Samples and technical service data sheets describing the product's properties and applications are available from Hart Products Corp, 1440 Broadway, New York 18, NY.

Lauramine 314-A

Lauramine 314-A, a product of Laurel Soap Mfg Co, Inc, is described as a quality anionic finishing agent for superior aftertreating of cotton (especially knitting) yarns. A white, medium-viscosity paste, Lauramine 314-A is said to be fully resistant to the adverse effect of aging, and will not turn rancid.

It is stated that Lauramine 314-A is best used alone as a self-finish. It is compatible, however, with other finishing materials, except cationics, and reportedly may safely be used in combination. It cannot alter even the most delicate shades of dyed goods, and whites stay white, it is claimed.

The Company states that Lauramine 314-A is highly stable in neutral and mildly alkaline solutions, though acid combinations should be avoided. It is said to be excellent for finishing dye lots where high concentrations of salt fixatives are required, as it shows stability in up to 1% sodium chloride solutions.

A free sample is available from Laurel Soap Mfg Co, Inc, Tioga, Thompson & Almond Streets, Philadelphia 34, Pa.

Capracyl Brown HR

A new dye that reportedly gives a bluish-brown shade on filament or spun nylon and wool, builds up brown tones readily from pastel to heavy shades, and has good fastness properties, has been introduced by the Du Pont Company's Dyes and Chemicals Division.

Designated Capracyl Brown HR, the dye is said to be suited especially to continuous dyeing of wool rawstock, dyes levelly, and exhibits good affinity from neutral or slightly acidic dyebaths.

New Fluoro-organics

In announcing availability in developmental quantities of two new additions to its line of fluoro-organics, Pennsalt Chemicals Corp has disclosed a number of specific new end-uses which exploit the unusual properties of fluorine.

The new intermediates, trifluoroethyl chloride and trifluoroethanol, are said to be the basis for dyestuffs of improved lightfastness, and more stable, fire-retardant polymers of the trifluoroethoxy vinylic and acrylic types.

Less fully utilized in industrial processing is an important technical concept of solvency. Trifluoroethanol is said to be a powerful ionizing solvent for organic materials and, importantly, does not irreversibly solvate the ions formed. Pennsalt expects that these properties, when recognized, will find direct major industrial use in common unit processes. Further information may be obtained from Technical Division, Pennsalt Chemicals Corp, 3 Penn Center, Philadelphia 2, Pa.

Celanese Producing Beta-propiolactone Commercially

Celanese Corporation of America is producing commercial quantities of beta-propiolactone, a petrochemical intermediate, at its Pampa, Tex, plant.

As a chemical intermediate, beta-propiolactone's potential embraces a wide range of compounds, such as amines, alcohols and others containing active hydrogen. In addition, it is used in the synthesis of acrylic acid and acrylates, markets for which are currently expanding in textile finishing. It is also reported to modify textile fibers to improve hand and other properties.

Prices for manufacturing grade beta-propiolactone are 87 cents a pound in tank car lots, 89 cents in carload drums, 90 cents for single drums and two dollars a pound in glass containers, all FOB Pampa. Celanese is the sole producer of the chemical, it is stated.

New Dyestuff Intermediates

Aceto Chemical Co, Inc, has announced the availability of Dinitroaniline and, from semiworks production, the availability of Methyl Isopropyl Ketone. Both are suggested as dyestuff intermediates.

According to Aceto's information, this is the only source of Methyl Isopropyl Ketone in commercial quantities now available in the United States.

Irgalan Navy Blue 2GL

A new greenish shade of navy blue has been added to its premetalized Irgalan line by Geigy Dyestuffs, Division of Geigy Chemical Corporation.

The new dyestuff, Irgalan Navy Blue 2GL, is recommended by Geigy for dyeing wool in the piece or yarn, as well as raw stock and slubbing, and for raw silk, nylon and polyamide fibers, as a self color and for shading purposes. In combination with Irgalan Navy Blue 5RL, a wide range of navy blues can be achieved.

The most desirable property of this new coloring agent, according to Geigy, is its good lightfastness, with a 6-7 rating for wool and 7-8 rating for spun nylon in sunlight; and 6 for wool and 7 for spun nylon in Fade-Ometer. According to the manufacturer, Irgalan Navy Blue 2GL's excellent fastness rating in sunlight on nylon makes it particularly suited for the automotive upholstery trade, and for other applications requiring extremely good lightfastness.

This new product also is said to have high degrees of fastness to washing, water and perspiration; good solubility; good exhaustion when used in neutral dyebaths; and good penetration and level dyeing. One of its particularly worthwhile qualities is said to be its shade in artificial light, under which it goes greener. Navy Blue 2GL also has good fastness to milling, sea water, carbonizing, hot pressing and decatizing, it is claimed.

Oxanal Fast Black GL

A new addition to its range of fast Oxanal dyes for anodized aluminum has been announced by Ciba Co, Inc. Known as Oxanal Fast Black GL, the new dye reportedly offers a clean, neutral black shade of excellent light and weathering fastness in regular aluminum dyeing procedures.

Said to be superior in many respects to the usual black dye mixes for coloring aluminum, Oxanal Fast Black GL is a straight or homogeneous dye. It exhibits a jet black shade at full strength and, in very light depth, offers a bluish-green tone. When applied to anodized aluminum by standard procedures, Oxanal Fast Black GL reportedly imparts a smooth, even color over the practical shade-depth range. Full strength shades exhibit the best fastness, particularly the best fastness to light fading. Water sealing for 30 minutes at the boil, pH 6.0, is said to give top results in an aluminum black.

Resistance to light fading (Fade-Ometer and in sunlight testing) is claimed to be very good. Weathering tests reportedly show very little or no shade change in one year's exposure. While different alloys of aluminum give different dyeing results on pure aluminum, Ciba states that Oxanal Fast Black GL consistently gives far better results than any other aluminum black available on the market.

Cuprofix Yellow C-2GL paf; Brilliant Alizarine Milling Green 2GL paf

Cuprofix Yellow C-2GL paf is a bright new after-coppering yellow, just released by Sandoz, Inc, for use on cotton and regenerated cellulosic fibers. It is said to offer excellent "money value." Reportedly characterized by very good solubility and stability to hard water, the dye reserves cellulose acetate. It is suitable for pad dyeing and can be dyed with any of the other Cuprofix "C" brands to give combination shades. Upon aftertreatment with copper sulfate/acetic acid or Cuprofix the dyeings reportedly show excellent lightfastness and very good wetfastness properties. Shades of Cuprofix Yellow C-2GL paf are reported stable to resin anticrease finishing.

For dyeing bright greens on woolens and worsteds, nylons or silks, Brilliant Alizarine Milling Green 2GL paf is said to provide very good fastness to light, washing, perspiration, decatizing, and carbonizing. The color reportedly withstands acid and alkaline milling, and its brilliant yellowish green shade is unaffected by chrome. Recommended applications include prints on wool, silk and polyamide fibers, and for Vigoureux printing. Full details on Brilliant Alizarine Milling Green 2GL paf may be seen in Sandoz circular 1329.

NOTE

Putnam Chemical Corp, Beacon, NY, has called our attention to discrepancies in the spelling of the trade names of two of its products listed on page 894 of the December 2nd issue (1957 Processing Review Number).

The name "Basofil WW" as published, should correctly read "Basofix WW".

"Basonol AO Powder", as published, should correctly read "Basolon AO Powder".

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